AMERICAN
DYESTUFF REPORTER

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VOLUME XX | JUNE 8, 1931 | NUMBER 11

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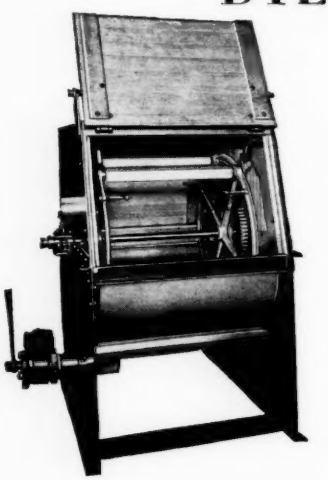

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Volume XX | JUNE 8, 1931 | Number 11

Training Chemists in Industry*

By H. W. ELLEY

Chemical Director, Dyestuffs Dept., E. I. du Pont de Nemours & Co.

Any real enlightenment in regard to the training of chemists in industry should immediately appeal to three groups of persons. First. The works chemist who has such men to train. Second. The young graduate chemist who necessarily needs such a training. Third. The College Professor and Instructor in whose hands the preliminary, and perhaps after all the most important, part of their training, rests, as the latter often has it within his hands to make it hard or easy for the former. A large number of the readers of the REPORTER come under some one of the three groups and this article written by one who has had a broad experience in the successful training of chemists should prove interesting and instructive.

No two men are alike which perhaps after all is fortunate. One of the important tasks of the Research Director is to fit all of the different men that come to him into the right place. Dr. Elley tells how it may be done.

PROBABLY it is not as true now, as it was formerly, that a chemist completing his collegiate training is quite unfamiliar with industrial conditions. I recall my own experiences quite some time ago, when I had completed my college work, and certainly my idea of industry was very vague. The Chemical Departments of Universities were not besieged by Industrial Personnel men who wished to tell the prospective graduate about Industry in general and their companies in particular. However, we are concerned with the present and future and it is undoubtedly true that nowadays, the chemist has many opportunities for contacting Industry and knows something about it. It is still true, however, that there is practically no possibility of his spending sufficient time, during his college work, to become very familiar with any branch of applied chemistry. Neither can he know, in detail, about the internal workings of a manufacturing enterprise. The exception to this is, of course, with those colleges that give cooperative courses in which the chemist or engineer spends part time in some industrial plant.

We find that properly chosen men when they come to us, have very good grounding in the fundamentals of chemistry and also have those personal characteristics which should enable them to work efficiently and harmoniously with their fellow chemists and those directing the work. The necessity of intimate familiarity with the basic fundamental facts of chemistry cannot be overemphasized. Chemistry is entirely concerned with the multitudinous combinations of matter and although new compounds are found to be unique in their properties yet it is only an average or a consolidation of the properties of the constituent parts in that particular configuration. Something can be guessed or foretold of the possibilities inherent in a compound if the properties and reactive capabilities of the component groups are known. This basic information is the foundation material of chemical building and how can progress be made if the specifications of the building materials are unknown. The architect does not have any conception of the individual projects he will be called upon to design when he is studying, but he does know that by proper preparation he can combine design and materials to create anything which man can reasonably conceive. The same is true in chemistry. The task confronting the employer, therefore, is to so guide the newcomer's activities that in the shortest possible time he will become familiar with the detailed subject matter and with the objectives of the organization and be able to carry on independent work efficiently.

In general, there are two types of chemists who come to us. The first is represented by the four and five year men and the second by those who have pursued their post-graduate studies for several years and have received

* Paper delivered May 9 at Students' Training Course of Chemical Industries Exhibition.

their doctor's degree. There has been much discussion in regard to the necessity for Ph.D. training in order that a chemist might be eligible for the greatest advancement. Experience shows that it is not essential but that it helps greatly—particularly from the standpoint of speed of advancement. In most companies the Ph.D. is placed in research work immediately and he starts out at a salary substantially higher than the four year man. Moreover, there seems to be a more or less subconscious tendency to advance the Ph.D. more rapidly to positions of greater responsibility. However, it should be pointed out that some of our most productive, capable and important men do not have advanced degrees and this proves that the higher degree is not a prerequisite to advancement and that in the final analysis, it depends on the man and what he is able to deliver in the way of accomplishment. It is an open question as to how much farther or faster a four year man would have gone if he had started out with an advanced degree. In *either* case, it is necessary to give them additional training to enable them to carry on research work in the laboratory or to participate in the manufacturing operations. The training depends on the extent of the collegiate work and the type of activity which the individual seems best adapted to or for which he has a predilection.

If you wish to take the Dyestuffs Department of the DuPont Company as an example of the methods employed in training chemists, I can tell you what the conditions are and what happens to a newly arrived chemist. It is of interest to note that all of the chemists are originally located in the research laboratory and gain their first experience in this section of the department. The research laboratory is composed of a group of divisions each having from 10 to 30 chemists and corresponding to the natural classifications of the work being carried on. In this laboratory we have seven divisions, some of which have component sections. Each division is directed by an experienced chemist of considerable maturity and background. In fact any of the division heads would be qualified to carry on independently and because of the size of their staff and the diversity and complexity of the work they direct, their divisions are really comparable to an independent research laboratory.

In one of the research divisions there is placed the central analytical laboratory of the department. The analytical laboratory has various lines of activity, one dealing with the analysis of raw materials, from which official specifications are set up; another with the analysis of control samples from the manufacturing process as a check on similar analyses carried out by the plant laboratories; another analyzes samples which are the result of research investigations while still another is concerned with the development of new and more accurate methods of analysis. It is evident, therefore, that in this section it might be said that it is possible to get a cross section of the entire activities of the department. Because of the fact that the four and five year chemists have had little or no experience in conducting research investigations and would consequently be under a considerable handicap in that type of work, it has been found very advantageous to him to be placed in the analytical section when he is starting out. He already knows something of the technique required and he has an opportunity to add to his fund of knowledge in a normal manner. As soon as he has mastered one determination he is given a new one. He is urged to inquire into the source of the sample he analyzes; and to get a description of the process from which it came; to study the technical literature pertaining to the subject; to discuss it with the chemist submitting the sample and thus to gradually become versed in the art. In order that the new chemist may see a little farther than the horizon of the analytical laboratory he is taken on scheduled visits to the various manufacturing areas and under the guidance of the plant supervisor or superintendent the operations being carried on are explained to him in as much detail as he would be expected to appreciate. In this way he obtains a very concrete idea of what is going on and is able to see an application of some of his laboratory experience in terms of tons of material and to get an ultimate visualization of the profits on which industrial companies are established. His work becomes more real to him and he attacks the daily work with increased enthusiasm.

As his experience grows, he is given problems which tie in very directly and intimately with research problems or manufacturing operations. If the purity of a product is low, he is asked to identify and estimate the nature and amount of the impurities present in order that an idea may be gained of the side reactions which are going on. An appreciation of this sort and a knowledge of the conditions under which these compounds could be formed will many times suggest a modification of procedure which will result in substantial increases in yield of the desired product. The application of analytical methods and technique to synthetic reactions frequently results in improvement in synthetic work.

Another most important phase of the analyst's work is in the development of control methods by the use of which the progress of a reaction can be followed or the purity of the final product can be accurately determined. The working out of such methods requires absolute familiarity with the chemistry involved in the particular synthesis under consideration as well as a broad knowledge of chemistry in general so that reactions may be employed which will be effective in solving the immediate problem. I venture to say that a chemist who is required to work out a wide variety of control methods must know more chemistry than chemists whose duty it is to synthesize new compounds in a highly specialized field. And it should be pointed out that without adequate chemical control, and this means accurate analytical methods, progress is bound to be slow and very uncertain. During this period the chemist has an opportunity to find himself and to form a better idea of whether or not the industrial environment really appeals to him. He is thrown into con-

(Continued on page 383)

Proceedings of the American Association of Textile Chemists and Colorists

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* * *

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Conditions in Full Fashioned Hosiery Industry*

By Wilfred Gray

IN REFERENCE to the textile industry of Philadelphia and vicinity, particularly the full fashioned hosiery branch, conditions are undergoing rapid changes due to three or four outstanding reasons.

A very close study of the other branches would be necessary before the speaker would be qualified to criticize or comment upon them. However, the following remarks might bear on the other branches in a general way and I believe they do.

The first difficulty presented by experiences in manufacturing hosiery was the woeful lack of confidence between labor and manufacturers. This was occasioned by the high-handed methods of the pioneers in our business in their relation to employees, both of whom were spoiled by too much profit on one side and too much wages on the other.

It was a frequent occurrence in the early days of the full fashioned industry for a mill owner to oust the help for a misunderstanding or disagreement on any one point and in a few days call them back again and grant their demand because he was losing valuable profit and no attention whatever was paid to the economics of the affair.

Outside of economics—psychology or fairness never received any attention.

After repeated lockouts and subsequent recalls to duty the employees decided to unite and fight for some of the huge profits accruing to the manufacturer.

This started the Full Fashioned Hosiery Union and their ranks were increased materially by merging and absorbing the Federated Union members.

The worst strike previous to the present one was as unnecessary as it was foolish and unfair except that manufacturers began to foresee the closer profits caused by increased factories and therefore closer competition.

*Presented before the Philadelphia Section, April 24, 1931.

This unrest started about 1919 and culminated in the strike of 1921.

The employees were asked to take a fifteen per cent reduction due only to the fact that a few manufacturers among the group decided to reduce wages to insure their profits for a year or so more. The employees knowing that there were abnormal profits in the business due to the increased equipment, which incidentally, is very expensive, refused a reduction. Their contention being, that as long as there was no reduction in profits, there should in all fairness be none in labor.

This the speaker considers fair reasoning because any business not highly competitive certainly pays larger returns to the owner and should show larger wages to the employee.

No such attitude, however, was considered by the employer and of course when a reduction was proposed the Union refused to accept it.

The attitude of the speaker at that time was—if the public would pay prices asked, we would run at full capacity at rates then prevailing.

The resultant strike lasted about six months and was lost by the manufacturers. Employees were taken back at the same rates that prevailed before the strike which naturally gave Union members a feeling of strength which shortly led to the second abuse which was exercised by the Union exactly as had been the case of the manufacturers previous to that time.

Therefore, the second difficulty arose, namely, strongly organized labor in which group was a young, rowdy element that were just as high-handed as the old time manufacturer. Their membership and resources grew rapidly and they in turn became arrogant and dictatorial, which led to numerous clashes and increased the friction considerably.

About this time, 1926 or 1927, large numbers of open shops started business and operators could be had easily because some of the Union members disliked the constant wrangling and as they received no reduction in piece work price, it was rather easy for manufacturers to get help. These men were smart enough to know that sooner or later the insolence of the union worker would not be tolerated and such insolence would lead to numerous interruptions to steady employment. They figured that at the same rates their yearly wage would be better, due to the absence of these interruptions.

Later in the development of wage and production plans these same men worked for less wages per unit, but received more money than union operators because at that time they were asked to operate two machines instead of one. This fact drew still more of the best knitters out of the Union and made itself an issue about the time competition was first noticed, namely, about 1928 and 1929.

The present strike is not one for a permanent arrangement of wages to insure the Union worker a final scale, but unfortunately also to make every manufacturer accept a Union agreement which is as unthinkable as it is un-American and which I may also add will not be accepted by the best owners.

The plan adopted by the Union was to get one or more Union operators in all open shops and on a certain day call these operators out and intimidate the others so that they would quit work through fear.

Chaotic conditions then in our industry have been caused by foolish employers in the first place and later by the idea of Unionism to dominate business in which they have no investment and sad to say, not any, or very little interest.

Conditions of this kind are very unsound. How can stability hold if manufacturers are to be dictated to by a group of men who are manifestly not able to conduct even their own personal affairs in an orderly fashion?

Coupled with this is the pitiable misunderstanding on the part of officials in power, especially Magistrates, who only consider that there being about 200 or 300 times more workmen than owners, they of course must support the side with the most votes.

When the law-bodies, especially the enforcement branch of the law, realize that every man is entitled to work if he wishes to without the chance of having his home painted yellow and his family security endangered by rowdies who use acid, bricks, etc., just then and no sooner will the Textile Industry be secure and feel that there is no necessity to move out of Philadelphia.

The exodus has begun and it will continue just as the yarn business left New England, the seamless hosiery and textiles left New England and Pennsylvania and the shoe business left Massachusetts.

For the large numbers of loyal and sensible help who realize that supply and demand control wages more than do the mill owners, there should be a determined effort on the part of manufacturers to constantly try to educate the city and county authorities to their duty to all industries, that are besieged by conditions over which they have no control, to the end that all people who want to work may do so in safety.

This idea will have to be sold to these authorities because most of them do not look to the protection of those who happen to be in the minority.

There are also some fine Executives in the City and adjoining Counties who will listen and listen more attentively if the problems are put before them concisely by Chambers of Commerce in preference to constant visits of individual manufacturers.

One more and final factor is a clearer and more distinct understanding of our employees' hopes, ideas and thoughts.

Men who work for a stipulated wage are entitled to thoughtful consideration and they should experience a greater willingness on the part of the employer to give them necessary amounts of information to help them get the proper attitude and confidence in the personnel who operate the business.

They should be more secure in their planning of the future by some effort to help in times of stress and unemployment. This is a development constantly gaining in favor with the best thinking concerns and one which will do more to bring capital and labor to a peaceful success than any other consideration.

Classification of the Fastness of Dyed Textiles in the Standard Sunlight Exposure Test[1,2]

By Wm. H. Cady[3], Wm. C. Smith[4], and Wm. D. Appel[5].

The relative fastness to light of 1196 cotton, wool, silk, and weighted silk dyeings representing 366 dyestuffs was determined by exposing them to sunlight in the standard "sun test" of the American Association of Textile Chemists and Colorists. Tables showing the classification of the dyeings into seven fastness classes and an exposition of the method of classication are given. The paper should be of special interest to producers and users of dyestuffs.

DURING 1926, 1927 and 1928 the sub-committee exposed a comprehensive series of textile dyeings to sunlight under conditions which have since been adopted as standard by the American Association of Textile Chemists and Colorists[6,7]. The dyeings were exposed simultaneously, therefore their relative fastness to light could be determined. Fresh portions of most of the dyeings were exposed again in the same way one year after the first series was exposed with results which were in excellent agreement with those first obtained. Thus the fading behavior of the dyeings was duplicable. On the basis of the results obtained the dyeings have now been classified with reference to their relative fastness to light.

A brief description of the dyeings and the method of exposing and classifying them follows. The classification is then presented in tabular form and a discussion of some of the results is given.

Procedure

1. *Dyeings.*

The dyeings were made by eighteen cooperating laboratories on cloth furnished by the committee. A single length of each of the four kinds of cloth was used. The fabrics were: bleached cotton cloth, plain weave, weighing three ounces per square yard; half-blood worsted cloth, plain weave, weighing eight ounces per square yard; "Cinderella" silk cloth, plain weave, unweighted, weighing 1½ ounces per square yard; and silk crepe made with a spun silk warp and a gum silk filling, weighing 3 ounces per square yard and containing 35 to 40 per cent of tin weighting.

Dyestuffs which are in common use or for some other reason are of general interest were selected. Cotton and silk dyes were applied in

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[1] Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

[2] This is the fourth in a series of studies being carried out by the Sub-Committee on Fastness to Light, American Association of Textile Chemists and Colorists in cooperation with the Bureau of Standards. For previous papers see Am. Dyestuff Reptr. **16**, 707-719; **17**, 410-422; **18**, 407-446. The membership of the Sub-Committee follows: Wm. H. Cady, Wm. D. Appel, Hugh Christison, Arthur E. Hirst, George A. Moran, Walter M. Scott.

[3] Chairman of the Sub-Committee.

[4] Research Associate, A. A. T. C. & C.

[5] Chief, Textile Section, Bureau of Standards.

[6] Full details concerning this work and a comparison of the fading of the dyeings in sunlight, in other types of daylight and in carbon arc lamp light are given in a previous report by Cady and Appel, "The fading of dyed textiles in daylight and in carbon arc light", Am. Dyestuff Reptr. **18**, 407-446, June 24, 1929.

[7] This "sun test" was adopted as the official standard method of the Association on December 6, 1930. See Am. Dyestuff Reptr. **19**, 811, December 22, 1930.

[8] A number of the dyeings listed in the previous report[6] were not considered to be representative and accordingly their fastness was not classified.

two concentrations and wool dyes in three. The total number of dyeings in the present list is 1196[8], of which 410 are cotton, 428 wool, 332 silk, and 26 weighted silk. The total number of dyes represented is 366, of which 239 can be assigned "Colour Index" numbers.

2. *Method of Exposure.*

Samples cut from the dyeings were exposed on the roof of the Industrial Building, Bureau of Standards, Washington, D. C., in the standard sun test, as follows: They were placed at an angle of 45 degrees from the horizontal, facing south, between 9 a. m. and 3 p. m. on sunny days only, in cabinets covered with a good grade of window glass approximately one-eighth of an inch thick and open at the sides in such a way as to allow free access of air to the samples. The distance between the samples and the glass was one-half inch[9].

Each sample was exposed for four different periods of time, each period being double that of the next shorter period. The most fugitive samples were exposed for periods of 6, 12, 24, and 48 hours. Samples which did not fade in 6 hours but did fade slightly in 12 hours were exposed for 12, 24, 48, and 96 hours. Depending on the fastness of the color, other samples were exposed for 24, 48, 96, and 192 hours; 48, 96, 192, and 384 hours; or 96, 192, 384, and 768 hours. It was intended to have each sample just barely faded in the shortest exposure and badly faded in the longest with two distinct steps between.

The exposed area measured 1¼ inches square and each was adjacent to a similar unexposed area on the same sample which was covered with opaque black cardboard during the test.

The exposures were made between June 18 and October 15, in 1926, 1927 and 1928, with the exception of the longer exposures, some of which were carried on during March, April, and May. A complete record of the dates of exposures is given in the previous report[6].

3. *Method of Classification.*

Seven degrees of fastness were found to be clearly recognizable in these tests and the dyeings were classified accordingly. The basis for the classification may be stated in general terms as follows:

Class 0. Dyeings which show an appreciable alteration in color when exposed for 6 hours in the standard sun test and considerable alteration when exposed for 12 hours.

Class 1. Dyeings which show little or no alteration in color when exposed for 6 hours, but which show an appreciable alteration in 12 hours.

Class 2. Dyeings which show little or no alteration in color when exposed for 12 hours, but appreciable alteration in 24 hours.

Class 3. Dyeings which show little or no alteration in color when exposed for 24 hours, but appreciable alteration in 48 hours.

Class 4. Dyeings which show little or no alteration in color when exposed for 48 hours, but appreciable alteration in 96 hours.

Class 5. Dyeings which show little or no alteration in color when exposed for 96 hours, but appreciable alteration in 192 hours.

Class 6. Dyeings which show little or no alteration in color when exposed for 192 hours.

In order to eliminate the uncertainty inherent in the terms "appreciable", "considerable", and "little", dyeings were selected from among the tested samples to represent the minimum requirements for classes 1 to 6. The dyeing selected as a minimum standard for class 1 served also for class 0 since dyeings which were not so fast as this standard were assigned to class 0. To be in class 1, 2, 3, etc., in the accompanying tables a dyeing was at least equal in fastness to the standard for the class and not so fast as the standard for the next higher class. It will be noted that the standard for each class is just twice as fast as that for the next lower class, i. e., its change in color on exposure to light for twice the time is equal to that of the standard for the next lower class.

The use of standards of fastness selected from the dyeings made it possible by comparison to take into account the changes in color in longer exposures, changes which cannot be adequately described in the classification scheme outlined above. This was desirable because dyeings show varied behavior when exposed to light for different periods of time. Some dyeings change in color in a short exposure and then change but little more in longer exposures.

The color changes on which the classification is based were considered from the viewpoint of the user of dyed textiles. Two dyeings were considered to be equal in fastness when they exhibited changes in color in the same exposures which were noticeable (and objectionable from the standpoint of the user) to the same extent. Thus one of the dyeings might become lighter and the other darker and still show the same extent of change in color. In this connection it was necessary to take into consideration the nature of the color change. Changes in hue are often more objectionable to the user of textiles than equal changes in brilliance or saturation of color. A color which merely becomes paler or duller is not so liable to disrupt a color scheme as one which changes in hue.

Little difficulty was experienced in deciding whether a full strength dyeing of one hue, for example green, was changed in color more or less than a standard of another hue, for example red. It was difficult to classify some of the pale tints using standards of full strength. It was particularly difficult to classify dyeings which

[9] The reader is referred to the previous report, see footnote 6, for detailed information concerning method of mounting and labeling, spectral transmission of the glass covers, the exposure cabinets, etc.

faded more in a short exposure and less in a longer exposure than a standard. Such dyeings were placed in the same class as the standard if in the opinion of the classifier the dyeing would be as satisfactory to the user as the standard with reference to light fastness. If not, it was assigned to the next lower class.

The classification is not based on the judgment of one person. The dyeings were classified by I. M. Welch and independently by Wm. D. Appel when the exposures were first completed. Later Wm. C. Smith reclassified them and finally the classification tables thus developed were carefully checked and rechecked against the samples by Wm. H. Cady and reviewed by Walter M. Scott and Hugh Christison.

Classification Table

The relative fastness to light of the dyeings in the standard sun exposure test is given in Table 1. The dyeings are listed in the order of the "Colour Index"[10] number of the dyestuff with which they were made. Those to which Colour Index numbers cannot be assigned follow in alphabetical order. The most fugitive dyeings are assigned to Class 0, the fastest to Class 6 in accordance with the scheme already described. For each dyeing there is indicated the fiber on which the dye is applied, the name of the dye and of the manufacturer, amount of dye used in per cent of the weight of the fiber (the dyeings are full shades if the strength is not indicated), and dyeing method. A key to the abbreviations for the names of the dye manufacturers is given in Table 2. A key to the dyeing methods which are indicated by numbers in Table 1 is given in Table 3. The serial number in the last column of Table 1 is a ready reference to the previous report[6] in which is recorded the behavior of these same dyeings in other light exposures.

Discussion

The user of these tables will no doubt want to correlate them with the service to be expected from the dyeings. It may be stated at once that no rigid correlation is possible. Two dyeings which have the same fastness to light in the standard sun test *may* vary materially in fastness under different conditions of use and in different localities. The following correlation is based on the *average* fading of all of the dyeings listed in the tables when exposed in Washington, D. C., under conditions described elsewhere[6]. Many variations from the average are noted in the previous report. This correlation can be taken only as relative and indicative. The following table gives the number of days of continuous exposure in a south or a north window with little or no change in color that may be expected of dyeings in the different classes. Considerably longer service may not result in objectionable fading.

Class	South window	North window
0	less than 2 days	less than 4 days
1	2 days	4 days
2	5 days	8 days
3	9 days	16 days
4	19 days	32 days
5	37 days	64 days
6	75 days	128 days

It has long been recognized that dyeings made from a given dyestuff may have quite different degrees of fastness to light depending upon the material which is dyed, the amount of dye used, the method of application, and other conditions not involved in these tests, such as finishing processes[11]. It is also well known that dyeings made with a mixture of dyestuffs frequently do not exhibit the fastness to light which might be predicted from the fastness of the components of the mixture[12]. These facts must be taken into consideration in using the tables. It should be emphasized that when two dyeings are compared, their relative fastness will not represent the true relationship of the dyes from which they were made unless the dyeings are of equal depth of shade. This explains why the dyeings of Fast Light Yellow 2G, C. I. 636, have no higher classification in these tables than the equal percentage dyeings of Tartrazine Conc., C. I. 640, and why 1% Alizarine Irisol R., C. I. 1073, has the same classification as 1% Wool Violet 4BN, C. I. 698. It is expected that the tables will be of greatest service to those who are already familiar with the utility of some of the dyes for their specific purposes.

The reasons for selecting the sun test as the standard and for basing the present classification on it, instead of on some continuous daylight exposure as has been the European practice, are first that the results are duplicable and second that the test conditions are the most severe with reference to *light* exposure and least severe with reference to the action of other agencies such as atmospheric humidity. The direct action of the weather, and of such service conditions as laundering are not represented in this test.

The choice of standards of fastness to light for general use is an important outcome of this work which is receiving further consideration. The dyeings which were used as standards in the work reported in this paper need not be enumerated because they are not the best for general laboratory use. The committee has selected a set of standards which will be made available by the Association if they prove to be satisfactory in the trials now planned.

[10] Colour Index of the Society of Dyers and Colourists, Bradford, England, 1924. Also Supplement to the Colour Index, 1928.

[11] J. J. Hummel, "Fast and fugitive dyes". J. Soc. of Arts (Br.) **39**, 535-551 (1891).

[12] Wm. H. Cady, "Abnormal Fading", Am. Dyestuff Reptr., **20**, 49-52, Jan. 19, 1931.

The advantage of having each standard twice as fast as the preceding is twofold. The spread of the fastness classes increases in a regular way which appears to bear the most useful correlation with service requirements. A standard for one class fades in its appropriate series of exposures just as the standard for any other class fades in its appropriate exposures. Thus one standard dyeing can be used to judge dyeings exposed in any other series. This is not considered a reliable procedure at present but may be a means of simplifying the test later.

The classification procedure does not eliminate personal judgment. Indeed, it does not appear to be possible to do so until the minimum requirements for each fastness class can be expressed quantitatively in terms of the least perceptible differences in color between the unexposed and exposed portions of the dyeings. No satisfactory measure of this kind is available at this time. Until one is developed, the use of dyeings of known fastness as standards for visual evaluation appears to be the only practicable method.

Table I

Classification of Fastness of Dyeings

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
5	Wool	3	0.2%	Acid Green O	CAL	1	609
	Wool	3	1.0%	Acid Green O	CAL	1	608
	Wool	6	5.0%	Acid Green O	CAL	1	607
	Wool	6	7.0%	Naphthol Green B	GEN	1	1500
10	Wool	0	0.2%	Naphthol Yellow S	CAL	1	645
	Wool	0	1.0%	Naphthol Yellow S	CAL	1	644
	Wool	1	5.0%	Naphthol Yellow S	CAL	1	643
16	Silk	2	0.5%	Pontacyl Fast Yellow G	DP	1	380
	Silk	3	2.0%	Pontacyl Fast Yellow G	DP	1	379
20	Cotton	0	0.5%	Chrysoidine Y Extra	NA	9	1035
	Cotton	1	1.0%	Chrysoidine Y Extra	NA	9	1034
	Silk	0	1.0%	Chrysoidine Y Extra	GEN	2	921
	Silk	1	3.0%	Chrysoidine Y Extra	GEN	2	920
27	Wool	2	0.2%	Wool Orange 2G Cryst.	NA	1	440
	Wool	4	1.0%	Wool Orange 2G Cryst.	NA	1	439
	Wool	6	5.0%	Wool Orange 2G Cryst.	NA	1	438
	Silk	2	0.5%	Wool Orange 2G Cryst.	NA	1	230
	Silk	3	2.0%	Wool Orange 2G Cryst.	NA	1	229
29	Silk	3	0.5%	Acid Phloxine G	NEW	1	56
	Silk	3	2.0%	Acid Phloxine G	NEW	1	55
31	Wool	2	0.2%	Pontacyl Carmine 2G	DP	1	470
	Wool	3	1.0%	Pontacyl Carmine 2G	DP	1	469
	Wool	4	5.0%	Pontacyl Carmine 2G	DP	1	468
	Silk	2	0.5%	Pontacyl Carmine 2G	DP	1	384
	Silk	3	2.0%	Pontacyl Carmine 2G	DP	1	383
32	Silk	3	0.5%	Brilliant Anthracene Red 5BL	GARF	1	372
	Silk	3	2.0%	Brilliant Anthracene Red 5BL	GARF	1	371
36	Wool	2	0.25%	Alizarine Yellow 2G	GEN	5	588
	Wool	3	0.5%	Alizarine Yellow 2G	GEN	5	587
	Wool	4	1.0%	Alizarine Yellow 2G	GEN	5	586
38	Cotton	3		β-Naphthol and Metanitraniline	—	10	1333
40	Wool	2	0.25%	Pontachrome Yellow 3R	DP	5	597
	Wool	2	0.5%	Pontachrome Yellow 3R	DP	5	596
	Wool	3	1.0%	Pontachrome Yellow 3R	DP	5	595
44	Cotton	3		β-Naphthol and Paranitraniline	—	10	1332
53	Wool	0	0.2%	Acid Violet 4BS	NEW	1	621
	Wool	1	1.0%	Acid Violet 4BS	NEW	1	620
	Wool	4	5.0%	Acid Violet 4BS	NEW	1	619
54	Wool	4	4.5%	Azo Acid Red B	GEN	1	1503
	Wool	2	0.2%	Azo Crimson S	GEN	1	449
	Wool	2	1.0%	Azo Crimson S	GEN	1	448
	Wool	4	5.0%	Azo Crimson S	GEN	1	447
56	Wool	1	0.2%	Fast Fuchsine 6B	NA	1	455
	Wool	3	1.0%	Fast Fuchsine 6B	NA	1	454
	Wool	4	5.0%	Fast Fuchsine 6B	NA	1	453
	Silk	2	0.5%	Fast Fuchsine 6B	NA	1	252
	Silk	2	2.0%	Fast Fuchsine 6B	NA	1	251

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
57*	Wool	2	0.2%	Ethonic Fast Fuchsine 2B	CAMP	1	431
	Wool	2	1.0%	Ethonic Fast Fuchsine 2B	CAMP	1	429
	Wool	4	5.0%	Ethonic Fast Fuchsine 2B	CAMP	1	430
57	Wool	2	0.2%	Fast Crimson 6BL	NA	1	422
	Wool	2	1.0%	Fast Crimson 6BL	NA	1	421
	Wool	3	5.0%	Fast Crimson 6BL	NA	1	420
	Silk	2	0.5%	Fast Crimson 6BL	NA	1	232
	Silk	2	2.0%	Fast Crimson 6BL	NA	1	231
59	Wool	0	1.0%	Azo Acid Blue B	SAN	1	1435
	Wool	1	2.0%	Azo Acid Blue B	SAN	1	1436
	Wool	2	5.0%	Azo Acid Blue B	SAN	1	1437
79	Silk	1	0.5%	Acid Scarlet 2R	NEW	1	58
	Silk	1	2.0%	Acid Scarlet 2R	NEW	1	57
	Silk	1	2.0%	Ponceau RG	BDC	12	1490
	Wool	2	1.5%	Ponceau RR	GEN	1	1506
	Wool	1	0.2%	Scarlet 2R	CENT	1	413
	Wool	2	1.0%	Scarlet 2R	CENT	1	412
	Wool	4	5.0%	Scarlet 2R	CENT	1	411
82	Cotton	3		β-Naphthol and α-Naphthylamine	—	10	1331
98	Wool	2	0.5%	Acid Anthracene Brown RHA	GEN	5	557
	Wool	2	1.0%	Acid Anthracene Brown RHA	GEN	5	556
	Wool	4	2.0%	Acid Anthracene Brown RHA	GEN	5	555
101	Wool	2	0.5%	Alizarine Brown B	CAL	5	560
	Wool	3	1.0%	Alizarine Brown B	CAL	5	559
	Wool	4	2.0%	Alizarine Brown B	CAL	5	558
110	Wool	2	0.125%	Diamond Flavine GA	GEN	4	594
	Wool	2	0.25%	Diamond Flavine GA	GEN	4	593
	Wool	3	0.5%	Diamond Flavine GA	GEN	4	592
126	Cotton	1	0.5%	Direct Fast Pink E2GN	NEW	1	171
	Cotton	1	2.0%	Direct Fast Pink E2GN	NEW	1	172
	Silk	2	0.5%	Direct Fast Pink E2GN	NEW	3	100
	Silk	2	2.0%	Direct Fast Pink E2GN	NEW	3	99
128	Cotton	1	0.5%	Erie Pink 2B	NA	1	173
	Cotton	1	2.0%	Erie Pink 2B	NA	1	174
	Silk	1	0.5%	Erie Pink 2B	NA	3	248
	Silk	2	2.0%	Erie Pink 2B	NA	3	247
130	Cotton	1	0.5%	Direct Fast Pink EB Ex.	NEW	1	127
	Cotton	1	2.0%	Direct Fast Pink EB Ex.	NEW	1	128
135	Cotton	0	0.5%	Indoine Blue R	GEI	9	1025
	Cotton	1	1.0%	Indoine Blue R	GEI	9	1024
	Cotton	1	1.0%	Indoine Blue R	GEN	9	1493
138	Wool	2	0.2%	Metanil Yellow 1955	NA	2	437
	Wool	2	1.0%	Metanil Yellow 1955	NA	2	436
	Wool	2	5.0%	Metanil Yellow 1955	NA	2	435
	Silk	2	0.5%	Metanil Yellow Conc.	DP	1	382
	Silk	2	2.0%	Metanil Yellow Conc.	DP	1	381
146	Wool	1	1.0%	Azo Yellow A 5 W	NA	1	1389
	Wool	1	2.0%	Azo Yellow A 5 W	NA	1	1390
	Wool	1	5.0%	Azo Yellow A 5 W	NA	1	1391
	Silk	1	0.5%	Azo Yellow A 5 W	NA	1	260
	Silk	1	2.0%	Azo Yellow A 5 W	NA	1	259
151	Wool	1	0.2%	Wool Orange A Conc.	NA	1	446
	Wool	3	1.0%	Wool Orange A Conc.	NA	1	445
	Wool	5	5.0%	Wool Orange A Conc.	NA	1	444
	Silk	2	0.5%	Wool Orange A Conc.	NA	1	234
	Silk	3	2.0%	Wool Orange A Conc.	NA	1	233
153	Wool	2	0.2%	Azo Fuchsine GA	GEN	1	463
	Wool	2	1.0%	Azo Fuchsine GA	GEN	1	464
	Wool	3	5.0%	Azo Fuchsine GA	GEN	1	462
154	Silk	1	0.5%	Azo Fuchsine 6B	GEN	1	378
	Silk	2	2.0%	Azo Fuchsine 6B	GEN	1	377
167	Wool	3	0.5%	Acid Anthracene Brown B	GEN	4	554
	Wool	4	1.0%	Acid Anthracene Brown B	GEN	4	553
	Wool	5	2.0%	Acid Anthracene Brown B	GEN	4	552
168	Wool	2	1.0%	Superchrome Garnet Y	NA	4	1380
	Wool	2	2.0%	Superchrome Garnet Y	NA	4	1381
	Wool	3	5.0%	Superchrome Garnet Y	NA	4	1382

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
169	Wool	3	0.5%	Pontachrome Violet SW	DP	4	570
	Wool	4	1.0%	Pontachrome Violet SW	DP	4	569
	Wool	5	2.0%	Pontachrome Violet SW	DP	4	568
170	Wool	3	2.0%	Diamond Black PV	GEN	4	548
	Wool	4	4.0%	Diamond Black PV	GEN	4	547
	Wool	5	8.0%	Diamond Black PV	GEN	4	546
173	Wool	1	1.0%	Metachrome Violet B	GEN	6	1374
	Wool	2	2.0%	Metachrome Violet B	GEN	6	1375
	Wool	2	5.0%	Metachrome Violet B	GEN	6	1376
176	Wool	1	0.2%	Fast Red A	CAMP	1	416
	Wool	1	1.0%	Fast Red A	CAMP	1	415
	Wool	3	5.0%	Fast Red A	CAMP	1	414
	Silk	1	0.5%	Fast Red A	GEN	1	376
	Silk	2	2.0%	Fast Red A	GEN	1	375
	Silk	2	2.0%	Fast Red A	GEN	1	1482
	Wtd. Silk	1	2.0%	Fast Red A	GEN	1	1477
	Silk	1	0.5%	Fast Red S Conc.	NA	1	262
	Silk	2	2.0%	Fast Red S Conc.	NA	1	261
179	Wool	1	0.2%	Azo Rubine Conc.	CIBA	1	741
	Wool	3	1.0%	Azo Rubine Conc.	CIBA	1	740
	Wool	5	5.0%	Azo Rubine Conc.	CIBA	1	739
	Silk	2	0.5%	Azo Rubine R	NEW	1	52
	Silk	3	2.0%	Azo Rubine R	NEW	1	51
180	Wool	1	0.5%	Serichrome Blue R	NA	4	576
	Wool	2	1.0%	Serichrome Blue R	NA	4	575
	Wool	4	2.0%	Serichrome Blue R	NA	4	574
184	Wool	1	0.2%	Amacid Amaranth	AAP	1	428
	Wool	3	1.0%	Amacid Amaranth	AAP	1	427
	Wool	4	5.0%	Amacid Amaranth	AAP	1	426
	Wool	3	2.75%	Amaranth	GEN	1	1504
	Silk	1	0.5%	Amaranth 200%	NEW	1	212
	Silk	2	2.0%	Amaranth 200%	NEW	1	211
185	Silk	1	0.5%	Scarlet 4R	CAL	1	374
	Silk	2	2.0%	Scarlet 4R	CAL	1	373
195	Wool	2	0.25%	Superchrome Yellow GN	NA	4	591
	Wool	2	0.5%	Superchrome Yellow GN	NA	4	590
	Wool	3	1.0%	Superchrome Yellow GN	NA	4	589
201	Wool	3	1.0%	Erio Chrome Blue Black BC	GEI	4	798
	Wool	4	3.0%	Erio Chrome Blue Black BC	GEI	4	797
	Wool	5	5.0%	Erio Chrome Blue Black BC	GEI	4	796
202	Wool	3	1.0%	Erio Chrome Blue Black R	GEI	4	807
	Wool	4	3.0%	Erio Chrome Blue Black R	GEI	4	806
	Wool	5	6.0%	Erio Chrome Blue Black R	GEI	4	805
203	Wool	4	1.0%	Erio Chrome Black T	GEI	4	801
	Wool	5	3.0%	Erio Chrome Black T	GEI	4	800
	Wool	6	5.0%	Erio Chrome Black T	GEI	4	799
204	Wool	2	1.0%	Erio Chrome Black A	GEI	4	810
	Wool	5	3.0%	Erio Chrome Black A	GEI	4	809
	Wool	6	6.0%	Erio Chrome Black A	GEI	4	808
208	Wool	3	0.2%	Fast Wool Blue R	NA	2	762
	Wool	3	1.0%	Fast Wool Blue R	NA	2	761
	Wool	4	5.0%	Fast Wool Blue R	NA	2	760
209	Wool	3	1.0%	Fast Wool Blue B	NA	1	1386
	Wool	4	2.0%	Fast Wool Blue B	NA	1	1387
	Wool	5	5.0%	Fast Wool Blue B	NA	1	1388
216	Wool	4	0.5%	Superchrome Red B	NA	4	600
	Wool	5	1.0%	Superchrome Red B	NA	4	599
	Wool	6	2.0%	Superchrome Red B	NA	4	598
219	Wool	3	0.25%	Erio Chrome Flavine A Conc.	GEI	4	795
	Wool	4	1.0%	Erio Chrome Flavine A Conc.	GEI	4	794
	Wool	5	3.0%	Erio Chrome Flavine A Conc.	GEI	4	793
227	Silk	1	0.5%	Direct Fast Scarlet R	PEER	3	851
	Silk	2	2.0%	Direct Fast Scarlet R	PEER	3	850
234	Silk	1	0.5%	Resorcin Brown R	NA	1	228
	Silk	1	2.0%	Resorcin Brown R	NA	1	227
	Wool	1	0.2%	Resorcin Brown Y	CAL	2	624
	Wool	1	1.0%	Resorcin Brown Y	CAL	2	623
	Wool	2	5.0%	Resorcin Brown Y	CAL	2	622

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
246	Wool	1	0.2%	Acid Blue Black 10B	CIBA	1	774
	Wool	2	1.0%	Acid Blue Black 10B	CIBA	1	773
	Wool	5	5.0%	Acid Blue Black 10B	CIBA	1	772
	Wool	3	2.0%	Buffalo Black NBR	NA	1	1429
	Wool	4	4.0%	Buffalo black NBR	NA	1	1430
	Wool	5	8.0%	Buffalo Black NBR	NA	1	1431
	Silk	4	5.0%	Pontacyl Blue Black SX	DP	1	369
252	Wool	2	0.2%	Crocein Brill. MOO	GEN	1	461
	Wool	4	1.0%	Crocein Brill. MOO	GEN	1	460
	Wool	6	5.0%	Crocein Brill. MOO	GEN	1	459
	Silk	2	0.5%	Crocein Scarlet MOO	NA	1	258
	Silk	3	2.0%	Crocein Scarlet MOO	NA	1	257
262	Wool	1	0.2%	Anthranol Chrome Red B	US	2	419
	Wool	3	1.0%	Anthranol Chrome Red B	US	2	418
	Wool	4	5.0%	Anthranol Chrome Red B	US	2	417
273	Cotton	1	0.5%	Pontamine Brown D3G	DP	1	142
	Cotton	1	2.0%	Pontamine Brown D3G	DP	1	141
	Silk	1	0.5%	Pontamine Brown D3G	DP	3	488
	Silk	1	2.0%	Pontamine Brown D3G	DP	3	487
278	Cotton	3	2.5%	Benzo Fast Red 8BL	GEN	1	1499
	Silk	3	0.5%	Direct Fast Red 8BL	NEW	3	78
	Silk	4	2.0%	Direct Fast Red 8BL	NEW	3	77
	Cotton	2	0.5%	Pontamine Fast Red 8BL	DP	1	191
	Cotton	3	2.0%	Pontamine Fast Red 8BL	DP	1	192
	Silk	3	0.5%	Pontamine Fast Red 8BL	DP	3	853
	Silk	4	2.0%	Pontamine Fast Red 8BL	DP	3	852
289	Silk	2	0.5%	Fast Wool Cyanone R	NA	1	1475
	Silk	3	2.0%	Fast Wool Cyanone R	NA	1	1476
	Wtd. Silk	1	0.5%	Fast Wool Cyanone R	NA	5	1463
	Wtd. Silk	2	2.0%	Fast Wool Cyanone R	NA	5	1464
	Silk	2	0.5%	Fast Wool Cyanone 3R	NA	1	1473
	Silk	3	2.0%	Fast Wool Cyanone 3R	NA	1	1474
	Wtd. Silk	1	0.5%	Fast Wool Cyanone 3R	NA	5	1461
	Wtd. Silk	2	2.0%	Fast Wool Cyanone 3R	NA	5	1462
	Silk	2	0.5%	Pontacyl Fast Blue 5R Conc.	DP	3	368
	Silk	3	2.0%	Pontacyl Fast Blue 5R Conc.	DP	3	367
	Wool	2	0.2%	Fast Wool Cyanone 3R	NA	2	627
	Wool	3	1.0%	Fast Wool Cyanone 3R	NA	2	626
	Wool	5	5.0%	Fast Wool Cyanone 3R	NA	2	625
292	Wool	2	0.5%	Erio Chrome Verdone S	GEI	4	816
	Wool	2	1.0%	Erio Chrome Verdone S	GEI	4	815
	Wool	4	3.0%	Erio Chrome Verdone S	GEI	4	814
299	Wool	2	1.0%	Erio Chrome Black F Conc.	GEI	4	789
	Wool	4	3.0%	Erio Chrome Black F Conc.	GEI	4	788
	Wool	5	6.0%	Erio Chrome Black F Conc.	GEI	4	787
302	Wool	1	1.0%	Diamond Green 3GA	GEN	4	1423
	Wool	2	2.0%	Diamond Green 3GA	GEN	4	1424
	Wool	3	5.0%	Diamond Green 3GA	GEN	4	1425
307	Wool	2	0.2%	Durol Black B	NA	2	660
	Wool	3	1.0%	Durol Black B	NA	2	659
	Wool	5	5.0%	Durol Black B	NA	2	658
	Silk	4	5.0%	Pontacyl Fast Black BBO	DP	1	370
316	Cotton	3	0.5%	Diazo Indigo Blue 2RL	GEN	2	19
	Cotton	3	2.0%	Diazo Indigo Blue 2RL	GEN	2	20
317	Cotton	3	0.5%	Pontamine Diazo Blue M	DP	2	21
	Cotton	3	2.0%	Pontamine Diazo Blue M	DP	2	22
	Silk	5	4.0%	Pontamine Diazo Blue M	DP	7	888
319	Silk	2	0.5%	Benzo Fast Heliotrope BL	GEN	3	896
	Silk	3	2.0%	Benzo Fast Heliotrope BL	GEN	3	895
324a	Cotton	0	0.5%	Pontamine Diazo Scarlet R	DP	2	5
	Cotton	1	2.0%	Pontamine Diazo Scarlet R	DP	2	6
	Silk	2	4.0%	Pontamine Diazo Scarlet R	DP	7	499
	Cotton	0	0.5%	Rosanthrene Bordeaux B	CIBA	2	9
	Cotton	0	2.0%	Rosanthrene Bordeaux B	CIBA	2	10
	Silk	2	4.0%	Rosanthrene Bordeaux B	CIBA	7	496
326	Silk	2	0.5%	Direct Fast Orange RS	NEW	3	204
	Silk	3	2.0%	Direct Fast Orange RS	NEW	3	203
	Cotton	1	0.5%	Erie Fast Scarlet 4BA	NA	1	195
	Cotton	1	2.0%	Erie Fast Scarlet 4BA	NA	1	196
	Cotton	2	0.5%	Pontamine Fast Orange S	DP	1	132

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Cotton	2	2.0%	Pontamine Fast Orange S	DP	1	131
331	Cotton	0	0.5%	Bismarck Brown Y	GEN	9	1039
	Cotton	1	1.0%	Bismarck Brown Y	GEN	9	1038
336	Wool	4	2.0%	Anthranol Fast Black SE	US	4	542
	Wool	5	4.0%	Anthranol Fast Black SE	US	4	541
	Wool	6	8.0%	Anthranol Fast Black SE	US	4	540
	Silk	3	0.5%	Chlorantine Fast Yellow 4GL	CIBA	3	490
	Silk	4	2.0%	Chlorantine Fast Yellow 4GL	CIBA	3	489
346	Cotton	2	0.5%	Pontamine Light Yellow 5GX	DP	1	151
	Cotton	2	2.0%	Pontamine Light Yellow 5GX	DP	1	152
	Silk	2	0.5%	Pontamine Light Yellow 5GX	DP	3	849
	Silk	3	2.0%	Pontamine Light Yellow 5GX	DP	3	848
353	Cotton	2	0.5%	Solantine Pink 4BL	NA	1	1340
	Cotton	3	2.0%	Solantine Pink 4BL	NA	1	1341
353a	Silk	2	0.5%	Benzo Fast Heliotrope 4BL	GEN	3	898
	Silk	2	2.0%	Benzo Fast Heliotrope 4BL	GEN	3	897
365	Cotton	2	0.3%	Chrysophenine XXX Conc.	NEW	1	157
	Cotton	3	1.5%	Chrysophenine XXX Conc.	NEW	1	158
	Silk	4	0.5%	Chrysophenine XXX Conc.	NEW	3	208
	Silk	5	2.0%	Chrysophenine XXX Conc.	NEW	3	207
	Wtd. Silk	3	0.5%	Chrysophenine XXX Conc.	NEW	5	1455
	Wtd. Silk	5	2.0%	Chrysophenine XXX Conc.	NEW	5	1456
	Wool	2	0.2%	Direct Brilliant Yellow C	CAL	3	657
	Wool	3	1.0%	Direct Brilliant Yellow C	CAL	3	656
	Wool	5	5.0%	Direct Brilliant Yellow C	CAL	3	655
382	Wool	1	0.2%	Direct Fast Scarlet B	CAL	3	636
	Wool	2	1.0%	Direct Fast Scarlet B	CAL	3	635
	Wool	4	5.0%	Direct Fast Scarlet B	CAL	3	634
	Wool	1	0.2%	Direct Fast Scarlet 3B	CAL	3	639
	Wool	2	1.0%	Direct Fast Scarlet 3B	CAL	3	638
	Wool	3	5.0%	Direct Fast Scarlet 3B	CAL	3	637
	Silk	2	0.5%	Erie Scarlet B	NA	3	1471
	Silk	3	2.0%	Erie Scarlet B	NA	3	1472
	Wtd. Silk	2	0.5%	Erie Scarlet B	NA	5	1453
	Wtd. Silk	3	2.0%	Erie Scarlet B	NA	5	1454
	Cotton	1	0.5%	Erie Scarlet 3B	NA	1	117
	Cotton	1	2.0%	Erie Scarlet 3B	NA	1	118
	Silk	2	0.5%	Erie Scarlet 3B	NA	3	224
	Silk	3	2.0%	Erie Scarlet 3B	NA	3	223
	Wtd. Silk	2	0.5%	Erie Scarlet 3B	NA	5	1451
	Wtd. Silk	3	2.0%	Erie Scarlet 3B	NA	5	1452
387	Silk	1	0.5%	Direct Violet R	CAL	3	890
	Silk	1	2.0%	Direct Violet R	CAL	3	889
394	Silk	3	2.0%	Chlorazol Violet N	BDC	2	1489
	Silk	3	0.5%	Direct Violet N	NEW	3	98
	Silk	3	2.0%	Direct Violet N	NEW	3	97
	Cotton	2	0.5%	Pontamine Violet N	DP	1	167
	Cotton	2	2.0%	Pontamine Violet N	DP	1	168
401	Cotton	1	0.5%	Diazine Black H Extra	NA	1	45
	Cotton	1	2.0%	Diazine Black H Extra	NA	1	46
	Cotton	0	0.5%	Diazine Black H Extra	NA	2	37
	Cotton	1	2.0%	Diazine Black H Extra	NA	2	38
	Cotton	0	0.5%	Diazine Black H Extra	NA	5	39
	Cotton	1	2.0%	Diazine Black H Extra	NA	5	40
	Silk	0	0.5%	Diazine Black H Extra	NA	3	246
	Silk	1	2.0%	Diazine Black H Extra	NA	3	245
406	Cotton	0	0.5%	Direct Blue 2B Conc.	NEW	1	165
	Cotton	1	2.0%	Direct Blue 2B Conc.	NEW	1	166
	Silk	0	0.5%	Direct Blue 2B Conc.	NEW	3	96
	Silk	0	2.0%	Direct Blue 2B Conc.	NEW	3	95
410	Cotton	2	0.5%	Direct Yellow 4GC	NEW	1	124
	Cotton	2	2.0%	Direct Yellow 4GC	NEW	1	123
411	Silk	2	0.5%	Erie Yellow KM	NA	3	242
	Silk	3	2.0%	Erie Yellow KM	NA	3	241
415	Silk	2	0.5%	Direct Orange R	NEW	3	91
	Silk	2	2.0%	Direct Orange R	NEW	3	92
	Cotton	2	0.5%	Pontamine Orange R	DP	1	110
	Cotton	3	2.0%	Pontamine Orange R	DP	1	109
	Wool	1	0.2%	Pontamine Orange R	DP	3	615

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Wool	2	1.0%	Pontamine Orange R	DP	3	614
	Wool	3	5.0%	Pontamine Orange R	DP	3	613
419	Silk	4	2.0%	Chlorazol Fast Red FG	BDC	2	1488
	Wool	5	2.5%	Diamine Fast Red F	GEN	4	1502
	Wool	3	0.2%	Direct Fast Red F	CAL	3	642
	Wool	4	1.0%	Direct Fast Red F	CAL	3	641
	Wool	5	5.0%	Direct Fast Red F	CAL	3	640
	Silk	3	0.5%	Direct Fast Red F	NEW	3	60
	Silk	4	2.0%	Direct Fast Red F	NEW	3	59
	Cotton	2	0.5%	Erie Fast Red FD	NA	1	193
	Cotton	3	2.0%	Erie Fast Red FD	NA	1	194
420	Wool	1	0.2%	Direct Fast Brown M	CAL	3	654
	Wool	1	1.0%	Direct Fast Brown M	CAL	3	653
	Wool	3	5.0%	Direct Fast Brown M	CAL	3	652
	Cotton	1	0.5%	Direct Fast Brown M	NEW	1	147
	Cotton	1	2.0%	Direct Fast Brown M	NEW	1	148
	Silk	1	0.5%	Direct Fast Brown M	NEW	3	94
	Silk	1	2.0%	Direct Fast Brown M	NEW	3	93
430	Silk	2	0.5%	Polar Red G Conc.	GEI	1	873
	Silk	3	2.0%	Polar Red G Conc.	GEI	1	872
431	Wool	1	0.2%	Chrome Red A 4B	NEW	2	616
	Wool	2	1.0%	Chrome Red A 4B	NEW	2	617
	Wool	5	5.0%	Chrome Red A 4B	NEW	2	618
448	Silk	1	0.5%	Benzopurpurine 4B	NEW	3	84
	Silk	2	2.0%	Benzopurpurine 4B	NEW	3	83
	Cotton	1	0.5%	Purpurine 4B Conc.	DP	1	121
	Cotton	2	2.0%	Purpurine 4B Conc.	DP	1	122
471	Cotton	0	0.5%	Erie Violet 2B	NA	1	169
	Cotton	1	2.0%	Erie Violet 2B	NA	1	170
	Silk	1	4.0%	Erie Violet 2B	NA	7	200
477	Silk	0	0.5%	Direct Blue 3B Conc.	NEW	3	90
	Silk	0	2.0%	Direct Blue 3B Conc.	NEW	3	89
478	Cotton	1	0.5%	Erie Orange Y	NA	1	106
	Cotton	1	2.0%	Erie Orange Y	NA	1	105
	Silk	1	0.5%	Erie Orange Y	NA	3	244
	Silk	2	2.0%	Erie Orange Y	NA	3	243
	Wtd. Silk	1	0.5%	Erie Orange Y	NA	5	1449
	Wtd. Silk	2	2.0%	Erie Orange Y	NA	5	1450
487	Wool	1	0.2%	Acid Anthracene Red 3BM	GARF	2	606
	Wool	1	1.0%	Acid Anthracene Red 3BM	GARF	2	605
	Wool	2	5.0%	Acid Anthracene Red 3BM	GARF	2	604
502	Cotton	0	0.25%	Benzo Azurine G Extra	NEW	1	183
	Cotton	1	1.0%	Benzo Azurine G Extra	NEW	1	184
512	Cotton	0	0.5%	Direct Fast Blue RW	NEW	1	185
	Cotton	1	2.0%	Direct Fast Blue RW	NEW	1	186
	Silk	0	0.5%	Direct Fast Blue RW	NEW	3	82
	Silk	0	2.0%	Direct Fast Blue RW	NEW	3	81
518	Cotton	1	5.0%	Chicago Blue 6B	GEN	1	1494
	Cotton	0	0.25%	Direct Sky Blue 6B Conc.	NEW	1	136
	Cotton	1	1.0%	Direct Sky Blue 6B Conc.	NEW	1	135
	Cotton	4	0.25%	Direct Sky Blue 6B Conc.	NEW	6	134
	Cotton	5	1.0%	Direct Sky Blue 6B Conc.	NEW	6	133
	Silk	0	0.5%	Direct Sky Blue 6B Conc.	NEW	3	88
	Silk	0	2.0%	Direct Sky Blue 6B Conc.	NEW	3	87
520	Silk	0	0.5%	Direct Sky Blue	NEW	3	86
	Silk	0	2.0%	Direct Sky Blue	NEW	3	85
533	Silk	2	0.5%	Pontamine Fast Blue 2GL	DP	3	892
	Silk	3	2.0%	Pontamine Fast Blue 2GL	DP	3	891
	Silk	2	0.5%	Direct Fast Blue 4GL	NEW	3	66
	Silk	3	2.0%	Direct Fast Blue 4GL	NEW	3	65
	Cotton	2	0.5%	Solantine Blue 4GL	NA	1	130
	Cotton	3	2.0%	Solantine Blue 4GL	NA	1	129
539	Cotton	0	0.5%	Erie Black NR Extra	NA	1	161
	Cotton	1	5.0%	Erie Black NR Extra	NA	1	162
	Silk	0	1.0%	Erie Black NR Extra	NA	3	250
	Silk	1	5.0%	Erie Black NR Extra	NA	3	249
561	Cotton	0	0.5%	Trisulphon Brown B	SAN	1	113
	Cotton	1	2.0%	Trisulphon Brown B	SAN	1	114

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Silk	1	0.5%	Trisulphon Brown B	SAN	3	480
	Silk	1	2.0%	Trisulphon Brown B	SAN	3	479
581	Silk	1	1.0%	Direct Black EG 200%	NEW	3	64
	Silk	2	5.0%	Direct Black EG 200%	NEW	3	63
	Wtd. Silk	1	1.0%	Direct Black EG 200%	NEW	5	1447
	Wtd. Silk	2	5.0%	Direct Black EG 200%	NEW	5	1448
	Cotton	0	0.5%	Pontamine Black EX Conc.	DP	1	119
	Cotton	1	5.0%	Pontamine Black EX Conc.	DP	1	120
593	Wool	1	0.2%	Direct Green B	CAL	3	648
	Wool	2	1.0%	Direct Green B	CAL	3	647
	Wool	3	5.0%	Direct Green B	CAL	3	646
	Silk	1	0.5%	Direct Green B	NEW	3	70
	Silk	1	2.0%	Direct Green B	NEW	3	69
	Wtd. Silk	1	0.5%	Direct Green B	NEW	5	1445
	Wtd. Silk	1	2.0%	Direct Green B	NEW	5	1446
	Cotton	1	0.5%	Erie Green MT	NA	1	181
	Cotton	1	2.0%	Erie Green MT	NA	1	182
594	Silk	1	0.5%	Direct Green MTL	NEW	3	68
	Silk	1	2.0%	Direct Green MTL	NEW	3	67
	Cotton	1	0.5%	Pontamine Green GX	DP	1	177
	Cotton	1	2.0%	Pontamine Green GX	DP	1	178
598	Silk	1	0.5%	Direct Brown GRN	NEW	3	62
	Silk	1	2.0%	Direct Brown GRN	NEW	3	61
	Cotton	1	0.5%	Erie Fast Brown GR	NA	1	116
	Cotton	2	2.0%	Erie Fast Brown GR	NA	1	115
621	Cotton	1	0.5%	Direct Orange 2R	NEW	1	104
	Cotton	1	2.0%	Direct Orange 2R	NEW	1	103
	Silk	2	0.5%	Direct Orange 2R	NEW	3	206
	Silk	2	2.0%	Direct Orange 2R	NEW	3	205
622	Cotton	1	0.5%	Pontamine Yellow SX	DP	1	155
	Cotton	1	2.0%	Pontamine Yellow SX	DP	1	156
636	Wool	2	0.2%	Fast Light Yellow 2G	GRAS	1	729
	Wool	3	1.0%	Fast Light Yellow 2G	GRAS	1	728
	Wool	5	5.0%	Fast Light Yellow 2G	GRAS	1	727
	Wool	5	1.0%	Fast Light Yellow 3G	GEN	1	1395
	Wool	5	2.0%	Fast Light Yellow 3G	GEN	1	1396
	Wool	6	5.0%	Fast Light Yellow 3G	GEN	1	1397
	Silk	2	0.5%	Pontacyl Light Yellow 2G	DP	1	390
	Silk	4	2.0%	Pontacyl Light Yellow 2G	DP	1	389
639	Wool	3	0.2%	Xylene Light Yellow 2G	SAN	1	723
	Wool	5	1.0%	Xylene Light Yellow 2G	SAN	1	722
	Wool	6	5.0%	Xylene Light Yellow 2G	SAN	1	721
	Silk	3	0.5%	Xylene Light Yellow 2G	SAN	1	388
	Silk	5	2.0%	Xylene Light Yellow 2G	SAN	1	387
640	Wool	2	0.2%	Tartrazine Conc.	NA	1	720
	Wool	3	1.0%	Tartrazine Conc.	NA	1	719
	Wool	5	5.0%	Tartrazine Conc.	NA	1	718
	Silk	2	0.5%	Tartrazine XXX Conc.	PHAR	1	386
	Silk	3	2.0%	Tartrazine XXX Conc.	PHAR	1	385
642	Wool	4	1.0%	Polar Yellow 5G Conc.	GEI	1	1392
	Wool	4	2.0%	Polar Yellow 5G Conc.	GEI	1	1393
	Wool	5	5.0%	Polar Yellow 5G Conc.	GEI	1	1394
645	Wool	3	0.2%	Kiton Fast Yellow 3G	CIBA	1	732
	Wool	5	1.0%	Kiton Fast Yellow 3G	CIBA	1	731
	Wool	6	5.0%	Kiton Fast Yellow 3G	CIBA	1	730
652	Wool	3	1.0%	Erio Chrome Red B	GEI	4	792
	Wool	3	2.0%	Erio Chrome Red B	GEI	4	791
	Wool	4	4.0%	Erio Chrome Red B	GEI	4	790
654	Cotton	1	0.5%	Diazo Fast Yellow 2G	GEN	3	25
	Cotton	1	2.0%	Diazo Fast Yellow 2G	GEN	3	26
	Cotton	1	0.5%	Pontamine Diazo Yellow 2GL	DP	3	1338
	Cotton	2	2.0%	Pontamine Diazo Yellow 2GL	DP	3	1339
655	Cotton	0	0.5%	Auramine Conc.	DP	9	1019
	Cotton	0	1.0%	Auramine Conc.	DP	9	1018
	Silk	0	1.0%	Auramine Conc.	DP	2	919
	Silk	1	3.0%	Auramine Conc.	DP	2	918
657	Cotton	0	0.5%	Victoria Green WB	NA	9	997
	Cotton	1	1.0%	Victoria Green WB	NA	9	996

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Silk	0	0.5%	Victoria Green WB Cryst.	NA	2	236
	Silk	1	2.0%	Victoria Green WB Cryst.	NA	2	235
658	Cotton	0	0.5%	Setoglaucine	GEI	9	1041
	Cotton	1	1.0%	Setoglaucine	GEI	9	1040
661	Cotton	0	0.5%	Turquoise Blue GL Extra	GEN	9	1037
	Cotton	1	1.0%	Turquoise Blue GL Extra	GEN	9	1036
	Silk	0	0.5%	Turquoise Blue GM	GARF	1	366
	Silk	1	2.0%	Turquoise Blue GM	GARF	1	365
662	Cotton	0	0.5%	Brilliant Green Cryst.	GRAS	9	993
	Cotton	1	1.0%	Brilliant Green Cryst.	GRAS	9	992
	Silk	1	0.5%	Brilliant Green Cryst.	CAL	2	917
	Silk	1	2.0%	Brilliant Green Cryst.	CAL	2	916
666	Silk	0.	0.5%	Acid Green L	NA	1	256
	Silk	1	2.0%	Acid Green L	NA	1	255
	Wool	0	0.2%	Guinea Green	CIBA	1	780
	Wool	1	1.0%	Guinea Green	CIBA	1	779
	Wool	1	5.0%	Guinea Green	CIBA	1	778
667	Wool	0	0.2%	Brilliant Acid Green 6B	GEN	2	777
	Wool	1	1.0%	Brilliant Acid Green 6B	GEN	2	776
	Wool	1	5.0%	Brilliant Acid Green 6B	GEN	2	775
	Silk	1	0.5%	Fast Acid Green B	NA	1	213
	Silk	1	2.0%	Fast Acid Green B	NA	1	214
	Wtd. Silk	0	0.5%	Fast Acid Green B	NA	5	1459
	Wtd. Silk	1	2.0%	Fast Acid Green B	NA	5	1460
677	Cotton	0	0.5%	Fuchsine RS Cryst.	CAL	9	1003
	Cotton	0	1.0%	Fuchsine RS Cryst.	CAL	9	1002
	Silk	1	0.25%	Fuchsine RS Cryst.	CAL	4	915
	Silk	1	1.0%	Fuchsine RS Cryst.	CAL	4	914
680	Silk	1	1.0%	Methyl Violet 2B	BDC	13	1491
	Silk	0	0.25%	Methyl Violet 2B	NA	2	268
	Silk	1	1.0%	Methyl Violet 2B	NA	2	267
	Cotton	0	0.5%	Methyl Violet 2B Conc.	NA	9	1015
	Cotton	0	1.0%	Methyl Violet 2B Conc.	NA	9	1014
681	Cotton	0	0.5%	Crystal Violet P	GRAS	9	1043
	Cotton	0	1.0%	Crystal Violet P	GRAS	9	1042
692	Wool	0	0.2%	Acid Magenta Cryst.	CIBA	1	744
	Wool	1	1.0%	Acid Magenta Cryst.	CIBA	1	743
	Wool	2	5.0%	Acid Magenta Cryst.	CIBA	1	742
	Silk	0	0.5%	Acid Magenta Cryst.	CIBA	1	874
	Silk	1	2.0%	Acid Magenta Cryst.	CIBA	1	875
696	Wool	0	0.2%	Pontacyl Fast Violet 10B	DP	1	603
	Wool	1	1.0%	Pontacyl Fast Violet 10B	DP	1	602
	Wool	1	5.0%	Pontacyl Fast Violet 10B	DP	1	601
	Silk	0	0.5%	Pontacyl Fast Violet 10B	DP	1	364
	Silk	1	2.0%	Pontacyl Fast Violet 10B	DP	1	363
698	Wool	0	0.2%	Wool Violet 4BN	NA	2	630
	Wool	1	1.0%	Wool Violet 4BN	NA	2	629
	Wool	1	5.0%	Wool Violet 4BN	NA	2	628
	Silk	0	0.5%	Wool Violet 4BN	NA	1	264
	Silk	1	2.0%	Wool Violet 4BN	NA	1	263
	Wtd. Silk	0	0.5%	Wool Violet 4BN	NA	5	1457
	Wtd. Silk	1	2.0%	Wool Violet 4BN	NA	5	1458
699	Silk	0	0.5%	Acid Fast Violet BG	NA	1	1469
	Silk	1	2.0%	Acid Fast Violet BG	NA	1	1470
704	Silk	1	0.5%	Alkali Blue L	CAL	5	859
	Silk	1	2.0%	Alkali Blue L	CAL	5	858
707	Silk	1	0.5%	Soluble Blue 2G	DAV	1	362
	Silk	2	2.0%	Soluble Blue 2G	DAV	1	361
710	Cotton	0	0.5%	Brilliant Sky Blue 5G	GEN	1	149
	Cotton	1	2.0%	Brilliant Sky Blue 5G	GEN	1	150
712	Silk	1	0.5%	Alphazurine 2G	NA	1	216
	Silk	1	2.0%	Alphazurine 2G	NA	1	215
	Silk	1	0.5%	Kiton Pure Blue V	CIBA	1	410
	Silk	1	2.0%	Kiton Pure Blue V	CIBA	1	409
	Wool	1	0.2%	Kiton Pure Blue V	CIBA	1	771
	Wool	1	1.0%	Kiton Pure Blue V	CIBA	1	770
	Wool	1	5.0%	Kiton Pure Blue V	CIBA	1	769
714	Silk	1	0.5%	Alphazurine A	NA	1	220
	Silk	1	2.0%	Alphazurine A	NA	1	219

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Wool	1	0.2%	Patent Blue A	GEN	2	651
	Wool	1	1.0%	Patent Blue A	GEN	2	650
	Wool	1	5.0%	Patent Blue A	GEN	2	649
717	Wool	0	0.2%	Acid Violet 6BN	CIBA	1	768
	Wool	1	1.0%	Acid Violet 6BN	CIBA	1	767
	Wool	1	5.0%	Acid Violet 6BN	CIBA	1	766
720	Wool	1	0.25%	Erio Chrome Azurol B	GEI	4	813
	Wool	3	1.0%	Erio Chrome Azurol B	GEI	4	812
	Wool	4	3.0%	Erio Chrome Azurol B	GEI	4	811
728	Silk	0	0.5%	Victoria Blue R	GEN	2	1484
	Wtd. Silk	0	0.4%	Victoria Blue R	GEN	2	1481
729	Wool	0	0.14%	Victoria Blue B	CIBA	1	756
	Wool	0	0.7%	Victoria Blue B	CIBA	1	755
	Wool	1	3.5%	Victoria Blue B	CIBA	1	754
	Cotton	0	0.5%	Victoria Blue BX	DP	9	1017
	Cotton	0	1.0%	Victoria Blue BX	DP	9	1016
	Silk	0	0.25%	Victoria Blue BX	DP	2	861
	Silk	1	1.0%	Victoria Blue BX	DP	2	860
735	Silk	1	0.5%	Alkali Fast Green 2G	NA	1	226
	Silk	1	2.0%	Alkali Fast Green 2G	NA	1	225
	Wool	1	0.2%	Erio Green Extra	GEI	1	443
	Wool	1	1.0%	Erio Green Extra	GEI	1	442
	Wool	1	5.0%	Erio Green Extra	GEI	1	441
737	Wool	1	0.2%	Wool Green BSNA	GEN	1	452
	Wool	2	1.0%	Wool Green BSNA	GEN	1	451
	Wool	2	5.0%	Wool Green BSNA	GEN	1	450
	Silk	1	0.5%	Wool Green S	NA	1	1467
	Silk	1	2.0%	Wool Green S	NA	1	1468
749	Cotton	0	0.5%	Rhodamine B Extra	DP	9	1007
	Cotton	0	1.0%	Rhodamine B Extra	DP	9	1006
	Silk	1	0.25%	Rhodamine B Extra	DP	2	863
	Silk	1	1.0%	Rhodamine B Extra	DP	2	862
752	Silk	1	0.25%	Rhodamine 6G Extra	DP	2	887
	Silk	1	1.0%	Rhodamine 6G Extra	DP	2	886
	Cotton	0	0.5%	Rhodamine 6GDN Extra	GEN	9	1013
	Cotton	0	1.0%	Rhodamine 6GDN Extra	GEN	9	1012
758	Wool	1	5.0%	Acid Violet 4 RN	GEN	1	1505
	Silk	2	2.0%	Fast Acid Violet A2R	GEN	1	1485
	Wool	1	0.2%	Violamine DSA	LAM	2	467
	Wool	1	1.0%	Violamine DSA	LAM	2	466
	Wool	1	5.0%	Violamine DSA	LAM	2	465
	Silk	1	0.5%	Violamine RR	DP	1	408
	Silk	2	2.0%	Violamine RR	DP	1	407
768	Silk	0	0.5%	Eosine Y	GEN	2	865
	Silk	1	2.0%	Eosine Y	GEN	2	864
773	Silk	0	0.5%	Erythrosine B	DP	2	867
	Silk	0	2.0%	Erythrosine B	DP	2	866
793	Cotton	0	0.5%	Phosphine G	DP	9	1031
	Cotton	1	1.0%	Phosphine G	DP	9	1030
	Silk	0	0.5%	Phosphine G Conc.	DP	2	868
	Silk	1	2.0%	Phosphine G Conc.	DP	2	869
797	Cotton	0	0.5%	Euchrysine RRD	GEN	9	1027
	Cotton	0	1.0%	Euchrysine RRD	GEN	9	1026
	Silk	0	0.5%	Euchrysine RRDX	GEN	2	883
	Silk	0	2.0%	Euchrysine RRDX	GEN	2	882
801	Wool	1	0.2%	Quinoline Yellow O	GEN	1	425
	Wool	2	1.0%	Quinoline Yellow O	GEN	1	424
	Wool	3	5.0%	Quinoline Yellow O	GEN	1	423
	Silk	1	0.5%	Quinoline Yellow 180%	NA	1	222
	Silk	2	2.0%	Quinoline Yellow 180%	NA	1	221
812	Cotton	0	1.0%	Primuline NAC	NA	2	11
	Cotton	0	4.0%	Primuline NAC	NA	2	12
	Cotton	3	1.0%	Primuline NAC	NA	4	27
	Cotton	5	4.0%	Primuline NAC	NA	4	28
	Silk	2	10.0%	Primuline NAC	NA	7	269
813	Cotton	0	0.5%	Direct Pure Yellow M	NEW	1	125
	Cotton	0	2.0%	Direct Pure Yellow M	NEW	1	126
	Silk	0	0.5%	Direct Pure Yellow M	NEW	3	202
	Silk	0	2.0%	Direct Pure Yellow M	NEW	3	201

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
814	Cotton	2	0.5%	Direct Fast Yellow NN	NEW	1	175
	Cotton	4	2.0%	Direct Fast Yellow NN	NEW	1	176
	Wool	4	0.2%	Direct Fast Yellow NN	NEW	3	633
	Wool	5	1.0%	Direct Fast Yellow NN	NEW	3	632
	Wool	6	5.0%	Direct Fast Yellow NN	NEW	3	631
	Silk	3	0.5%	Direct Fast Yellow NN	NEW	3	80
	Silk	5	2.0%	Direct Fast Yellow NN	NEW	3	79
815	Cotton	0	0.5%	Thioflavine T	GEN	9	1023
	Cotton	0	1.0%	Thioflavine T	GEN	9	1022
	Silk	0	0.5%	Thioflavine TCN	DP	1	406
	Silk	0	2.0%	Thioflavine TCN	DP	1	405
816	Cotton	0	0.5%	Thioflavine S	DP	1	197
	Cotton	0	2.0%	Thioflavine S	DP	1	198
	Silk	0	0.5%	Thioflavine S	DP	3	486
	Silk	0	2.0%	Thioflavine S	DP	3	485
841	Cotton	0	0.5%	Safranine A	NA	9	999
	Cotton	1	1.0%	Safranine A	NA	9	998
	Silk	0	0.5%	Safranine A Conc.	NA	4	238
	Silk	1	2.0%	Safranine A Conc.	NA	4	237
843	Cotton	0	0.5%	Safranine 8B	NA	9	995
	Cotton	0	1.0%	Safranine 8B	NA	9	994
861	Silk	0	0.5%	Induline B Extra	NA	1	266
	Silk	1	2.0%	Induline B Extra	NA	1	265
865	Silk	1	1.0%	Nigrosine WSB Cryst.	DP	1	404
	Silk	1	5.0%	Nigrosine WSB Cryst.	DP	1	403
870	Cotton	5	—	Aniline Black	—	11	270
873	Cotton	0	0.5%	Fast Silk Gray M Conc.	NEW	9	1005
	Cotton	1	1.0%	Fast Silk Gray M Conc.	NEW	9	1004
	Silk	0	1.0%	Fast Silk Gray M Conc.	NEW	2	210
	Silk	1	3.0%	Fast Silk Gray M Conc.	NEW	2	209
876	Cotton	0	0.5%	Capri Blue GON	GEN	9	1033
	Cotton	2	1.0%	Capri Blue GON	GEN	9	1032
883	Wool	1	0.5%	Chrome Blue GCB	NA	5	579
	Wool	1	1.0%	Chrome Blue GCB	NA	5	578
	Wool	2	2.0%	Chrome Blue GCB	NA	5	577
909	Cotton	0	0.5%	New Blue DA Conc.	NA	9	1011
	Cotton	1	1.0%	New Blue DA Conc.	NA	9	1010
913	Cotton	0	0.5%	Nile Blue BX	GEN	9	1021
	Cotton	1	1.0%	Nile Blue BX	GEN	9	1020
	Silk	1	0.5%	Nile Blue BX	GEN	4	885
	Silk	1	2.0%	Nile Blue BX	GEN	4	884
922	Cotton	2	0.8%	Methylene Blue BG	GEN	9	1497
	Cotton	0	0.5%	Methylene Blue 2B	NA	9	1009
	Cotton	1	1.0%	Methylene Blue 2B	NA	9	1008
	Silk	0	0.5%	Methylene Blue 2B	NA	4	240
	Silk	1	2.0%	Methylene Blue 2B	NA	4	239
924	Cotton	0	0.5%	Methylene Green B	NA	9	1001
	Cotton	1	1.0%	Methylene Green B	NA	9	1000
926	Cotton	0	0.5%	Thionine Blue GO	GEN	9	1029
	Cotton	1	1.0%	Thionine Blue GO	GEN	9	1028
931	Wool	2	0.5%	Brilliant Alizarine Blue GA	GEN	5	582
	Wool	2	1.0%	Brilliant Alizarine Blue GA	GEN	5	581
	Wool	3	2.0%	Brilliant Alizarine Blue GA	GEN	5	580
948	Cotton	1	1.0%	Sulfogene Yellow GA	DP	8	294
	Cotton	1	4.0%	Sulfogene Yellow GA	DP	8	293
949	Cotton	2	1.0%	Sulphur Brown 2G	NA	8	290
	Cotton	2	4.0%	Sulphur Brown 2G	NA	8	289
956	Cotton	2	1.0%	Pyrogen Direct Blue RL	CIBA	8	284
	Cotton	3	4.0%	Pyrogen Direct Blue RL	CIBA	8	283
969	Silk	2	5.0%	Hydron Blue R Pdr.	GEN	6	527
	Silk	2	10.0%	Sulfanthrene Blue GR Paste	DP	6	846
971	Cotton	3	10.0%	Hydron Blue G Paste	GEN	7	1496
	Cotton	2	1.0%	Hydron Blue G Pdr.	GEN	7	964
	Cotton	3	4.0%	Hydron Blue G Pdr.	GEN	7	965
978	Cotton	3	1.0%	Sulphur Black R Ex. Conc.	NA	8	280
	Cotton	4	4.0%	Sulphur Black R Ex. Conc.	NA	8	279
	Silk	3	10.0%	Sulphur Black R Ex. Conc.	NA	6	535

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
	Cotton	5	8.0%	Sulphur Black T Extra	GEN	8	1495
988	Cotton	4	1.0%	Sulfogene Carbon BB Conc.	DP	8	931
	Cotton	5	4.0%	Sulfogene Carbon BB Conc.	DP	8	930
1006	Cotton	2	1.0%	Sulfogene Green M Conc.	DP	8	274
	Cotton	2	4.0%	Sulfogene Green M Conc.	DP	8	273
1012	Cotton	0	1.0%	Sulfogene Bordeaux 5B	DP	8	288
	Cotton	1	4.0%	Sulfogene Bordeaux 5B	DP	8	287
1034	Wool	3	0.2%	Alizarine Red S	GEN	5	684
	Wool	4	1.0%	Alizarine Red S	GEN	5	683
	Wool	5	3.0%	Alizarine Red S	GEN	5	682
1035	Wool	2	0.2%	Alizarine Brown ZWS	ZIN	5	678
	Wool	3	1.0%	Alizarine Brown ZWS	ZIN	5	677
	Wool	4	3.0%	Alizarine Brown ZWS	ZIN	5	676
1039	Cotton	5	—	Turkey Red (Alizarine GY)	BDC	14	1508
1051	Wool	1	0.2%	Alizarine Cyanine Blue GG Ex.	GEN	5	681
	Wool	2	1.0%	Alizarine Cyanine Blue GG Ex.	GEN	5	680
	Wool	4	3.0%	Alizarine Cyanine Blue GG Ex.	GEN	5	679
1053	Wool	1	0.2%	Alizarine Saphirol SE	GEN	1	696
	Wool	2	1.0%	Alizarine Saphirol SE	GEN	1	695
	Wool	4	3.0%	Alizarine Saphirol SE	GEN	1	694
	Silk	2	0.5%	Alizarine Saphirol SE	DP	1	400
	Silk	3	2.0%	Alizarine Saphirol SE	DP	1	399
1054	Wool	2	0.2%	Alizarine Blue SAP New	GEN	1	708
	Wool	3	1.0%	Alizarine Blue SAP New	GEN	1	707
	Wool	4	3.0%	Alizarine Blue SAP New	GEN	1	706
1058	Silk	2	0.5%	Alizarine Uranol 2B	GEN	1	394
	Silk	2	2.0%	Alizarine Uranol 2B	GEN	1	393
1060	Wool	3	1.0%	Anthracene Blue SWGG Pdr.	GEN	5	1417
	Wool	4	2.0%	Anthracene Blue SWGG Pdr.	GEN	5	1418
	Wool	5	5.0%	Anthracene Blue SWGG Pdr.	GEN	5	1419
1062	Wool	2	0.2%	Anthracene Blue WR	GEN	5	687
	Wool	3	1.0%	Anthracene Blue WR	GEN	5	686
	Wool	5	3.0%	Anthracene Blue WR	GEN	5	685
1067	Wool	1	0.2%	Alizarine Blue S	GEN	5	690
	Wool	1	1.0%	Alizarine Blue S	GEN	5	689
	Wool	2	3.0%	Alizarine Blue S	GEN	5	688
1073	Wool	1	0.2%	Alizarine Irisol R	GEN	1	699
	Wool	1	1.0%	Alizarine Irisol R	GEN	1	698
	Wool	3	3.0%	Alizarine Irisol R	GEN	1	697
	Silk	2	0.5%	Alizarine Irisol R	GEN	1	881
	Silk	3	2.0%	Alizarine Irisol R	GEN	1	880
1075	Wool	2	0.2%	Alizarine Astrol B	GEN	1	819
	Wool	2	1.0%	Alizarine Astrol B	GEN	1	818
	Wool	3	3.0%	Alizarine Astrol B	GEN	1	817
	Silk	2	0.5%	Alizarine Astrol B	GEN	1	392
	Silk	2	2.0%	Alizarine Astrol B	GEN	1	391
1076	Wool	2	0.2%	Cyananthrol R	GEN	1	702
	Wool	3	1.0%	Cyananthrol R	GEN	1	701
	Wool	4	3.0%	Cyananthrol R	GEN	1	700
1078	Silk	3	0.5%	Alizarine Cyanine Green CG Ex.	CHEM	1	398
	Silk	3	2.0%	Alizarine Cyanine Green CG Ex.	CHEM	1	397
	Silk	3	0.5%	Alizarine Cyanine Green 3G	GEN	1	396
	Silk	4	2.0%	Alizarine Cyanine Green 3G	GEN	1	395
	Wool	3	0.2%	Alizarine Cyanine Green G Ex.	GEN	1	714
	Wool	3	1.0%	Alizarine Cyanine Green G Ex.	GEN	1	713
	Wool	4	3.0%	Alizarine Cyanine Green G Ex.	GEN	1	712
1080	Wool	2	0.2%	Anthraquinone Violet	GEN	1	711
	Wool	3	1.0%	Anthraquinone Violet	GEN	1	710
	Wool	4	3.0%	Anthraquinone Violet	GEN	1	709
1081	Wool	2	0.2%	Anthraquinone Green GXN	GEN	1	675
	Wool	3	1.0%	Anthraquinone Green GXN	GEN	1	674
	Wool	4	3.0%	Anthraquinone Green GXN	GEN	1	673
	Wool	5	4.0%	Anthraquinone Green GXNO	GEN	1	1501
1085	Wool	2	0.2%	Alizarine Blue-Black B	CHEM	5	693
	Wool	3	1.0%	Alizarine Blue-Black B	CHEM	5	692
	Wool	6	3.0%	Alizarine Blue-Black B	CHEM	5	691

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
1088	Wool	2	0.2%	Alizarine Sky Blue B	GEN	1	705
	Wool	3	1.0%	Alizarine Sky Blue B	GEN	1	704
	Wool	4	3.0%	Alizarine Sky Blue B	GEN	1	703
	Silk	3	0.5%	Alizarine Sky Blue B	GEN	1	402
	Silk	3	2.0%	Alizarine Sky Blue B	GEN	1	401
1089	Wool	2	0.2%	Anthraquinone Blue SR Ex.	GEN	1	717
	Wool	3	1.0%	Anthraquinone Blue SR Ex.	GEN	1	716
	Wool	4	3.0%	Anthraquinone Blue SR Ex.	GEN	1	715
1091	Silk	2	0.5%	Alizarine Rubinol 3G	GEN	1	879
	Silk	4	2.0%	Alizarine Rubinol 3G	GEN	1	878
	Silk	2	0.5%	Alizarine Rubinol R	GEN	1	877
	Silk	3	2.0%	Alizarine Rubinol R	GEN	1	876
	Wool	2	0.2%	Alizarine Rubinol R	GEN	1	663
	Wool	3	1.0%	Alizarine Rubinol R	GEN	1	662
	Wool	4	3.0%	Alizarine Rubinol R	GEN	1	661
1092	Wool	2	0.2%	Alizarine Geranol B	GEN	1	666
	Wool	3	1.0%	Alizarine Geranol B	GEN	1	665
	Wool	4	3.0%	Alizarine Geranol B	GEN	1	664
1095	Cotton	1	5.0%	Anthra Yellow GC Paste	GEN	7	310
	Cotton	2	20.0%	Anthra Yellow GC Paste	GEN	7	309
	Silk	4	5.0%	Anthra Yellow GC Pdr.	GEN	6	517
1096	Cotton	3	2.5%	Ponsol Gold Orange G Dbl. Paste	DP	7	978
	Cotton	4	10.0%	Ponsol Gold Orange G Dbl. Paste	DP	7	979
1097	Cotton	3	2.5%	Ponsol Gold Orange RRT Paste	DP	7	976
	Cotton	5	10.0%	Ponsol Gold Orange RRT Paste	DP	7	977
1099	Silk	3	10.0%	Anthrene Dark Blue BO 25%	NEW	6	525
	Cotton	2	2.0%	Ponsol Dark Blue BR Paste	DP	7	950
	Cotton	4	8.0%	Ponsol Dark Blue BR Paste	DP	7	951
1101	Cotton	4	5.0%	Anthrene Jade Green Paste	NEW	7	952
	Cotton	5	20.0%	Anthrene Jade Green Paste	NEW	7	953
	Silk	4	40.0%	Anthrene Jade Green 40%	NEW	6	511
1102	Cotton	2	5.0%	Ponsol Green BN Paste	DP	7	954
	Cotton	3	20.0%	Ponsol Green BN Paste	DP	7	955
	Cotton	4	5.0%	Ponsol Green BN Paste	DP	13	956
	Cotton	5	20.0%	Ponsol Green BN Paste	DP	13	957
	Silk	2	1.0%	Ponsol Green BN Paste	DP	6	524
	Silk	3	10.0%	Ponsol Green BN Paste	DP	6	523
1104	Cotton	4	3.0%	Ponsol Violet RRD Paste	DP	7	944
	Cotton	5	12.0%	Ponsol Violet RRD Paste	DP	7	945
	Silk	3	5.0%	Ponsol Violet RRD Pdr.	DP	6	826
1109	Cotton	5	10.0%	Ponsol Blue 3G Paste	DP	7	1045
	Cotton	6	30.0%	Ponsol Blue 3G Paste	DP	7	1044
1111	Cotton	5	5.0%	Indanthrene Blue 5G Paste	GEN	7	342
	Cotton	6	20.0%	Indanthrene Blue 5G Paste	GEN	7	341
	Silk	5	5.0%	Indanthrene Blue 5G Pdr.	GEN	6	507
1113	Cotton	5	2.5%	Ponsol Blue GD Dbl. Paste	DP	7	948
	Cotton	6	10.0%	Ponsol Blue GD Dbl. Paste	DP	7	949
	Silk	4	2.0%	Ponsol Blue GD Dbl. Pdr.	DP	6	506
	Silk	5	20.0%	Ponsol Blue GD Dbl. Pdr.	DP	6	505
1115	Cotton	6	25.0%	Indanthrene Blue GC Paste	GEN	7	1492
1116	Cotton	5	5.0%	Indanthrene Green BB Paste	GEN	7	306
	Cotton	5	20.0%	Indanthrene Green BB Paste	GEN	7	305
	Silk	4	5.0%	Indanthrene Green BB Pdr.	GEN	6	822
1118	Cotton	3	1.25%	Ponsol Yellow G Dbl. Paste	DP	7	975
	Cotton	4	5.0%	Ponsol Yellow G Dbl. Paste	DP	7	974
1131	Cotton	4	5.0%	Indanthrene Red 5GK Paste	GEN	7	318
	Cotton	5	20.0%	Indanthrene Red 5GK Paste	GEN	7	317
1132	Cotton	3	5.0%	Indanthrene Yellow GK Paste	GEN	7	320
	Cotton	4	20.0%	Indanthrene Yellow GK Paste	GEN	7	319
	Silk	2	5.0%	Indanthrene Yellow GK Pdr.	GEN	6	824
1133	Cotton	3	4.0%	Ponsol Red AFF Dbl. Paste	DP	7	1334
	Cotton	3	16.0%	Ponsol Red AFF Dbl. Paste	DP	7	1335
1134	Cotton	5	5.0%	Indanthrene Brill. Violet BBK Paste	GEN	7	322
	Cotton	6	20.0%	Indanthrene Brill. Violet BBK Paste	GEN	7	321
	Silk	6	5.0%	Indanthrene Brill. Violet BBK Pdr.	GEN	6	501
1136	Cotton	4	5.0%	Indanthrene Orange 2RK Paste	GEN	7	316
	Cotton	5	20.0%	Indanthrene Orange 2RK Paste	GEN	7	315

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
1143	Cotton	5	5.0%	Anthra Bordeaux R Paste	GEN	7	328
	Cotton	5	20.0%	Anthra Bordeaux R Paste	GEN	7	327
1145	Cotton	4	5.0%	Indanthrene Gray GK Paste	GEN	7	298
	Cotton	5	20.0%	Indanthrene Gray GK Paste	GEN	7	297
1150	Cotton	4	1.5%	Indanthrene Olive R Paste	GEN	7	1362
	Cotton	5	7.5%	Indanthrene Olive R Paste	GEN	7	1363
1151	Cotton	6	5.0%	Indanthrene Brown R Paste	GEN	7	296
	Cotton	6	20.0%	Indanthrene Brown R Paste	GEN	7	295
1152	Cotton	6	5.0%	Indanthrene Brown G Paste	GEN	7	312
	Cotton	6	20.0%	Indanthrene Brown G Paste	GEN	7	311
1161	Cotton	3	5.0%	Ponsol Red Violet RRNX Paste	DP	7	946
	Cotton	5	20.0%	Ponsol Red Violet RRNX Paste	DP	7	947
1162	Cotton	5	5.0%	Indanthrene Red RK Paste	GEN	7	338
	Cotton	6	20.0%	Indanthrene Red RK Paste	GEN	7	337
1163	Cotton	5	5.0%	Indanthrene Violet BN Paste	GEN	7	336
	Cotton	6	20.0%	Indanthrene Violet BN Paste	GEN	7	335
1170	Cotton	2	1.25%	Cibanon Yellow R Pdr.	CIBA	7	972
	Cotton	2	5.0%	Cibanon Yellow R Pdr.	CIBA	7	973
1172	Cotton	5	1.5%	Cibanon Black 2B Paste	CIBA	7	1047
	Cotton	6	7.5%	Cibanon Black 2B Paste	CIBA	7	1046
1177	Cotton	3	—	Indigo—Medium	DP	7	359
	Cotton	3	—	Indigo—Heavy	DP	7	358
	Wool	2	—	Indigo, Vat dyed-Light	DP	9	1325
	Wool	4	—	Indigo, Vat dyed-Medium	DP	9	1326
	Wool	6	—	Indigo, Vat dyed-Heavy	DP	9	1327
1178	Cotton	2	—	Indigosol O-Light	DH	12	360
	Wool	2	1.25%	Indigosol O	DH	7	1328
	Wool	5	4.0%	Indigosol O	DH	8	1329
	Wool	6	15.0%	Indigosol O	DH	8	1330
1180	Wool	1	0.2%	Indigotine Conc.	CIBA	1	750
	Wool	1	1.0%	Indigotine Conc.	CIBA	1	749
	Wool	2	5.0%	Indigotine Conc.	CIBA	1	748
	Wool	1	3.0%	Indigotine I	GEN	1	1507
	Silk	1	1.0%	Indigotine Conc.	NA	1	218
	Silk	1	5.0%	Indigotine Conc.	NA	1	217
1183	Cotton	3	5.0%	Indigo RB Pdr.	GEN	7	939
	Cotton	3	20.0%	Indigo RB Pdr.	GEN	7	938
1184	Cotton	2	5.0%	Ciba Blue 2BD Paste	CIBA	7	962
	Cotton	4	20.0%	Ciba Blue 2BD Paste	CIBA	7	963
	Wool	0	2.0%	Ciba Blue 2B Pdr.	CIBA	9	1405
	Wool	1	5.0%	Ciba Blue 2B Pdr.	CIBA	9	1406
	Wool	3	30.0%	Ciba Blue 2B Pdr.	CIBA	9	1407
	Silk	3	5.0%	Ciba Blue 2B Pdr.	CIBA	6	515
1186	Cotton	2	1.25%	Indigo MLB/6B Pdr.	GEN	7	988
	Cotton	3	5.0%	Indigo MLB/6B Pdr.	GEN	7	989
	Silk	1	0.5%	Indigo MLB/6B Pdr.	GEN	6	504
	Silk	4	5.0%	Indigo MLB/6B Pdr.	GEN	6	503
1189	Cotton	2	2.5%	Brilliant Indigo 4G Pdr.	GEN	7	357
	Cotton	2	10.0%	Brilliant Indigo 4G Pdr.	GEN	7	356
	Silk	2	5.0%	Brilliant Indigo 4G Pdr.	GEN	6	842
1202	Cotton	2	5.0%	Alizarine Indigo G Paste	GEN	7	958
	Cotton	4	20.0%	Alizarine Indigo G Paste	GEN	7	959
1207	Cotton	3	10.0%	Thioindigo Red B Paste	GEN	7	355
	Cotton	5	40.0%	Thioindigo Red B Paste	GEN	7	354
	Wool	4	2.0%	Thioindigo Red B Paste	GEN	9	1402
	Wool	5	5.0%	Thioindigo Red B Paste	GEN	9	1403
	Wool	6	20.0%	Thioindigo Red B Paste	GEN	9	1404
1211	Cotton	3	5.0%	Sulfanthrene Pink FF Paste	DP	7	942
	Cotton	3	20.0%	Sulfanthrene Pink FF Paste	DP	7	943
	Silk	4	10.0%	Sulfanthrene Pink FF Dbl. Pdr.	DP	6	840
1212	Cotton	4	5.0%	Indanthrene Red Violet RH Paste	GEN	7	334
	Cotton	5	20.0%	Indanthrene Red Violet RH Paste	GEN	7	333
	Silk	4	5.0%	Indanthrene Red Violet RH Pdr.	GEN	6	529
1217	Cotton	2	1.25%	Helindone Orange R Pdr.	GEN	7	970
	Cotton	4	5.0%	Helindone Orange R Pdr.	GEN	7	971
	Silk	1	0.5%	Helindone Orange R Pdr.	GEN	6	532
	Silk	3	5.0%	Helindone Orange R Pdr.	GEN	6	531

(Table I—*Continued*)

Colour Index No.	Fiber	Fastness Class	Amount	Dye Name	Mfr.	Dyeing Method	Serial Number
1219	Cotton	2	1.25%	Helindone Violet R Pdr.	GEN	7	990
	Cotton	2	5.0%	Helindone Violet R Pdr.	GEN	7	991
	Silk	2	5.0%	Helindone Violet R Pdr.	GEN	6	838
1222	Cotton	2	1.25%	Ciba Violet B Pdr.	CIBA	7	986
	Cotton	3	5.0%	Ciba Violet B Pdr.	CIBA	7	987
	Silk	3	5.0%	Ciba Violet B Pdr.	CIBA	6	832
1226	Cotton	3	10.0%	Ciba Red G Paste	CIBA	7	984
	Cotton	4	40.0%	Ciba Red G Paste	CIBA	7	985
	Silk	4	10.0%	Ciba Red G Pdr.	CIBA	6	533
1227	Cotton	2	1.25%	Helindone Brown G Pdr.	GEN	7	968
	Cotton	2	5.0%	Helindone Brown G Pdr.	GEN	7	969
	Silk	2	5.0%	Helindone Brown G Pdr.	GEN	6	836
1228	Cotton	2	5.0%	Ciba Scarlet G Paste	CIBA	7	960
	Cotton	3	20.0%	Ciba Scarlet G Paste	CIBA	7	961
1232	Wool	2	1.0%	Fustic Cryst.	GEI	5	785
	Wool	3	3.0%	Fustic Cryst.	GEI	5	784
1246	Wool	3	6.0%	Hematine Cryst.	GEI	5	786
	Wtd. Silk	5	20.0%	Logwood Crystals-Black Iron Liquor	———	11	1444

Dyes to which Colour Index Numbers cannot be assigned arranged alphabetically by name

Dye Name and Manufacturer	Amount	Fiber	Fastness Class	Dyeing Method	Serial Number
Acid Alizarine Gray G (GEN)	2.0%	Silk	2	1	1486
Acid Alizarine Gray G (GEN)	3.0%	Wtd. Silk	1	1	1480
Alizarine Black RB Pdr. (ZIN)	1.0%	Wool	3	5	1411
Alizarine Black RB Pdr. (ZIN)	3.0%	Wool	4	5	1412
Alizarine Black RB Pdr. (ZIN)	6.0%	Wool	5	5	1413
Alizarine Direct Violet ER (GEN)	0.2%	Wool	2	1	669
Alizarine Direct Violet ER (GEN)	1.0%	Wool	3	1	668
Alizarine Direct Violet ER (GEN)	3.0%	Wool	3	1	667
Alizarine Fast Gray 2 BL (GEN)	0.2%	Wool	3	1	672
Alizarine Fast Gray 2 BL (GEN)	1.0%	Wool	3	1	671
Alizarine Fast Gray 2 BL (GEN)	3.0%	Wool	5	1	670
Alizarine Indigo Brown R Paste (GEN)	40.0%	Silk	6	6	909
Alizarine Indigo Gray B Pdr. (GEN)	10.0%	Silk	5	6	905
Alizarine Indigo Green B Paste (GEN)	20.0%	Silk	5	6	907
Alizarine Indigo Green G Paste (GEN)	20.0%	Silk	5	6	908
Alizarine Indigo Violet B Pdr. (GEN)	10.0%	Silk	4	6	906
Alizarine Red W B (GEN)	1.0%	Wool	4	5	1414
Alizarine Red W B (GEN)	2.0%	Wool	4	5	1415
Alizarine Red W B (GEN)	5.0%	Wool	4	5	1416
Alizarine Supra Blue A (GEN)	0.2%	Wool	3	1	1304
Alizarine Supra Blue A (GEN)	1.0%	Wool	4	1	1305
Alizarine Supra Blue A (GEN)	5.0%	Wool	4	1	1306
Alizarine Supra Blue A (GEN)	3.0%	Wtd. Silk	3	1	1479
Alizarine Supra Blue R (GEN)	0.2%	Wool	3	1	1316
Alizarine Supra Blue R (GEN)	1.0%	Wool	3	1	1317
Alizarine Supra Blue R (GEN)	5.0%	Wool	3	1	1318
Alizarol Black 3G (NA)	2.0%	Wool	4	4	1301
Alizarol Black 3G (NA)	4.0%	Wool	6	4	1302
Alizarol Black 3G (NA)	8.0%	Wool	6	4	1303
Anthosine B (GEN)	0.5%	Silk	2	1	904
Anthosine B (GEN)	2.0%	Silk	4	1	903
Anthosine 3B (GEN)	0.5%	Silk	2	1	857
Anthosine 3B (GEN)	2.0%	Silk	3	1	856
Anthosine 5B (GEN)	0.5%	Silk	2	1	855
Anthosine 5B (GEN)	2.0%	Silk	3	1	854
Anthracene Chromate Brown EB (GEN)	0.5%	Wool	2	6	551
Anthracene Chromate Brown EB (GEN)	1.0%	Wool	3	6	550
Anthracene Chromate Brown EB (GEN)	2.0%	Wool	5	6	559

(Table I—*Continued*)

Dye Name and Manufacturer	Amount	Fiber	Fastness Class	Dyeing Method	Serial Number
Anthrene Gold Orange 4R Paste (NEW)	5.0%	Cotton	3	7	980
Anthrene Gold Orange 4R Paste (NEW)	20.0%	Cotton	3	7	981
Benzo Fast Blue 8GL (GEN)	0.5%	Cotton	2	1	163
Benzo Fast Blue 8GL (GEN)	2.0%	Cotton	3	1	164
Benzo Fast Blue 8GL (GEN)	0.5%	Silk	2	3	492
Benzo Fast Blue 8GL (GEN)	2.0%	Silk	3	3	491
Benzo Fast Brown 3GL (GEN)	0.5%	Silk	3	3	902
Benzo Fast Brown 3GL (GEN)	2.0%	Silk	3	3	901
Benzo Fast Gray BL (GEN)	0.5%	Cotton	3	1	159
Benzo Fast Gray BL (GEN)	2.0%	Cotton	4	1	160
Benzo Fast Gray BL (GEN)	0.5%	Silk	2	3	482
Benzo Fast Gray BL (GEN)	2.0%	Silk	2	3	481
Benzo Fast Orange 2RL (GEN)	0.5%	Silk	3	3	894
Benzo Fast Orange 2RL (GEN)	2.0%	Silk	4	3	893
Benzoform Yellow GL (GEN)	0.5%	Silk	2	3	911
Benzoform Yellow GL (GEN)	2.0%	Silk	2	3	910
Benzyl Fast Blue L (CIBA)	0.2%	Wool	1	2	747
Benzyl Fast Blue L (CIBA)	1.0%	Wool	2	2	746
Benzyl Fast Blue L (CIBA)	5.0%	Wool	3	2	745
Brilliant Benzo Fast Yellow GL (GEN)	0.5%	Cotton	2	1	153
Brilliant Benzo Fast Yellow GL (GEN)	2.0%	Cotton	3	1	154
Brilliant Benzo Fast Yellow GL (GEN)	0.5%	Silk	2	3	478
Brilliant Benzo Fast Yellow GL (GEN)	2.0%	Silk	3	3	477
Brilliant Milling Blue B (GEN)	0.2%	Wool	0	2	765
Brilliant Milling Blue B (GEN)	1.0%	Wool	1	2	764
Brilliant Milling Blue B (GEN)	5.0%	Wool	1	2	763
Buffalo Black 3G (NA)	2.0%	Wool	3	1	1432
Buffalo Black 3G (NA)	4.0%	Wool	4	1	1433
Buffalo Black 3G (NA)	8.0%	Wool	5	1	1434
Chloramine Fast Orange ER (GARF)	0.5%	Cotton	1	1	108
Chloramine Fast Orange ER (GARF)	2.0%	Cotton	2	1	107
Chloramine Fast Orange ER (GARF)	0.5%	Silk	2	3	474
Chloramine Fast Orange ER (GARF)	2.0%	Silk	2	3	473
Chloramine Violet R (GEN)	0.5%	Silk	2	3	913
Chloramine Violet R (GEN)	2.0%	Silk	3	3	912
Chlorantine Fast Green B (CIBA)	0.75%	Cotton	2	1	179
Chlorantine Fast Green B (CIBA)	3.0%	Cotton	2	1	180
Chlorantine Fast Green B (CIBA)	0.5%	Silk	2	3	484
Chlorantine Fast Green B (CIBA)	2.0%	Silk	3	3	483
Chlorantine Fast Violet 4 BL (CIBA)	0.5%	Cotton	3	1	189
Chlorantine Fast Violet 4 BL (CIBA)	2.0%	Cotton	4	1	190
Chlorantine Fast Violet 4 BL (CIBA)	0.5%	Silk	2	3	472
Chlorantine Fast Violet 4 BL (CIBA)	2.0%	Silk	3	3	471
Chlorazol Fast Brown RK (BDC)	0.5%	Cotton	2	1	144
Chlorazol Fast Brown RK (BDC)	2.0%	Cotton	3	1	143
Chromate Brilliant Brown R (CHEM)	0.5%	Wool	1	6	567
Chromate Brilliant Brown R (CHEM)	1.0%	Wool	2	6	566
Chromate Brilliant Brown R (CHEM)	4.0%	Wool	3	6	564
Ciba Pink BG Paste (CIBA)	5.0%	Cotton	3	7	982
Ciba Pink BG Paste (CIBA)	20.0%	Cotton	4	7	983
Ciba Pink BG Pdr. (CIBA)	1.0%	Silk	3	6	835
Ciba Pink BG Pdr. (CIBA)	10.0%	Silk	5	6	834
Cibanon Orange 6R Pdr. (CIBA)	0.5%	Cotton	4	7	966
Cibanon Orange 6R Pdr. (CIBA)	2.0%	Cotton	5	7	967
Cibanon Orange 6R Pdr. (CIBA)	5.0%	Silk	4	6	519
Cloth Fast Red GR (CIBA)	0.2%	Wool	1	2	735
Cloth Fast Red GR (CIBA)	1.0%	Wool	2	2	734
Cloth Fast Red GR (CIBA)	5.0%	Wool	3	2	733
Cross-Dye Green 2G Conc. (BDC)	1.0%	Cotton	2	8	278
Cross-Dye Green 2G Conc. (BDC)	4.0%	Cotton	3	8	277
Diamine Catechine B (GEN)	0.5%	Cotton	1	1	146
Diamine Catechine B (GEN)	2.0%	Cotton	1	1	145
Diazanil Scarlet 6BA (GEN)	0.5%	Cotton	1	2	7
Diazanil Scarlet 6BA (GEN)	2.0%	Cotton	1	2	8
Diazanil Scarlet 6BA (GEN)	4.0%	Silk	3	7	497
Diazine Black V (NA)	0.5%	Cotton	1	2	41
Diazine Black V (NA)	2.0%	Cotton	1	2	42
Diazine Black V (NA)	0.5%	Cotton	1	5	43
Diazine Black V (NA)	2.0%	Cotton	1	5	44
Diazine Black V (NA)	10.0%	Silk	5	9	199

(Table I—*Continued*)

Dye Name and Manufacturer	Amount	Fiber	Fastness Class	Dyeing Method	Serial Number
Diazo Brilliant Green 3G (GEN)	0.5%	Cotton	1	3	23
Diazo Brilliant Green 3G (GEN)	2.0%	Cotton	1	3	24
Diazo Brilliant Green 3G (GEN)	4.0%	Silk	2	8	494
Diazo Brilliant Scarlet 2BL Ex. Conc. (GEN)	0.5%	Cotton	1	2	1
Diazo Brilliant Scarlet 2BL Ex. Conc. (GEN)	2.0%	Cotton	1	2	2
Diazo Fast Blue 6GW (CIBA)	0.5%	Cotton	2	2	17
Diazo Fast Blue 6GW (CIBA)	2.0%	Cotton	2	2	18
Diazo Green 3G (GEN)	0.5%	Cotton	0	2	1400
Diazo Green 3G (GEN)	2.0%	Cotton	1	2	1401
Diazo Green 3G (GEN)	0.5%	Cotton	0	3	1398
Diazo Green 3G (GEN)	2.0%	Cotton	1	3	1399
Diazo Indigo Blue 4GL Ex. (GEN)	0.5%	Cotton	4	2	15
Diazo Indigo Blue 4GL Ex. (GEN)	2.0%	Cotton	4	2	16
Diazo Indigo Blue 4GL Ex. (GEN)	4.0%	Silk	3	7	495
Diazyl Violet BL (DH)	0.5%	Cotton	1	2	13
Diazyl Violet BL (DH)	2.0%	Cotton	2	2	14
Direct Fast Black LR (NEW)	0.5%	Silk	1	3	76
Direct Fast Black LR (NEW)	2.0%	Silk	2	3	75
Direct Fast Blue SFF (NEW)	0.5%	Cotton	2	1	187
Direct Fast Blue SFF (NEW)	2.0%	Cotton	3	1	188
Direct Fast Blue SFF (NEW)	0.5%	Silk	3	3	74
Direct Fast Blue SFF (NEW)	2.0%	Silk	4	3	73
Erio Chrome Cyanine RC (GEI)	0.5%	Wool	2	4	804
Erio Chrome Cyanine RC (GEI)	1.0%	Wool	3	4	803
Erio Chrome Cyanine RC (GEI)	3.0%	Wool	4	4	802
Ethonic Fast Violet 2 RLN (CAMP)	0.2%	Wool	2	2	458
Ethonic Fast Violet 2 RLN (CAMP)	1.0%	Wool	3	2	457
Ethonic Fast Violet 2 RLN (CAMP)	5.0%	Wool	5	2	456
Fast Crimson R (NA)	0.2%	Wool	2	1	434
Fast Crimson R (NA)	1.0%	Wool	3	1	433
Fast Crimson R (NA)	5.0%	Wool	4	1	432
Fast Mordant Blue B (CHEM)	1.0%	Wool	4	4	1426
Fast Mordant Blue B (CHEM)	2.0%	Wool	4	4	1427
Fast Mordant Blue B (CHEM)	5.0%	Wool	5	4	1428
Fast Orange FSW (NEW)	0.5%	Silk	3	1	54
Fast Orange FSW (NEW)	2.0%	Silk	3	1	53
Helindone Blue B Paste (GEN)	2.0%	Cotton	2	7	1366
Helindone Blue B Paste (GEN)	10.0%	Cotton	3	7	1367
Hydron Brown G Paste (GEN)	5.0%	Cotton	5	7	314
Hydron Brown G Paste (GEN)	20.0%	Cotton	6	7	313
Hydron Brown G Pdr. (GEN)	5.0%	Silk	6	6	509
Hydron Brown R Pdr. (GEN)	5.0%	Silk	4	6	820
Indanthrene Blue 8GK Paste (GEN)	1.0%	Cotton	3	7	1358
Indanthrene Blue 8GK Paste (GEN)	5.0%	Cotton	4	7	1359
Indanthrene Blue Green B Dbl. Paste (GEN)	2.5%	Cotton	4	7	340
Indanthrene Blue Green B Dbl. Paste (GEN)	10.0%	Cotton	5	7	339
Indanthrene Brown 3R Paste (GEN)	5.0%	Cotton	5	7	302
Indanthrene Brown 3R Paste (GEN)	20.0%	Cotton	6	7	301
Indanthrene Gold Orange 3G Paste (GEN)	5.0%	Cotton	4	7	308
Indanthrene Gold Orange 3G Paste (GEN)	20.0%	Cotton	5	7	307
Indanthrene Golden Yellow GK Dbl. Paste (GEN)	1.0%	Cotton	2	7	1368
Indanthrene Golden Yellow GK Dbl. Paste (GEN)	5.0%	Cotton	3	7	1369
Indanthrene Gray 3B Dbl. Paste (GEN)	2.5%	Cotton	4	7	300
Indanthrene Gray 3B Dbl. Paste (GEN)	10.0%	Cotton	5	7	299
Indanthrene Gray 3B Dbl. Paste (GEN)	10.0%	Silk	3	6	537
Indanthrene Khaki GG Paste (GEN)	1.5%	Cotton	5	7	1360
Indanthrene Khaki GG Paste (GEN)	7.5%	Cotton	5	7	1361
Indanthrene Orange 3R Paste (GEN)	5.0%	Cotton	4	7	324
Indanthrene Orange 3R Paste (GEN)	20.0%	Cotton	5	7	323
Indanthrene Pink B Dbl. Paste (GEN)	2.5%	Cotton	4	7	332
Indanthrene Pink B Dbl. Paste (GEN)	10.0%	Cotton	5	7	331
Indanthrene Red GG Paste (GEN)	5.0%	Cotton	4	7	330
Indanthrene Red GG Paste (GEN)	20.0%	Cotton	5	7	329
Indanthrene Scarlet R Paste (GEN)	1.0%	Cotton	2	7	1364
Indanthrene Scarlet R Paste (GEN)	5.0%	Cotton	4	7	1365
Indanthrene Yellow Brown 3G Paste (GEN)	1.0%	Cotton	5	7	1356
Indanthrene Yellow Brown 3G Paste (GEN)	5.0%	Cotton	6	7	304
Indanthrene Yellow Brown 3G Paste (GEN)	20.0%	Cotton	6	7	303
Indanthrene Yellow RK Paste (GEN)	5.0%	Cotton	4	7	326

(Table I—*Continued*)

Dye Name and Manufacturer	Amount	Fiber	Fastness Class	Dyeing Method	Serial Number
Indanthrene Yellow RK Paste (GEN)	20.0%	Cotton	5	7	325
Indo Carbon CL (GEN)	1.5%	Cotton	3	8	1370
Indo Carbon CL (GEN)	6.0%	Cotton	5	8	1371
Indocyanine B (GEN)	0.2%	Wool	2	2	759
Indocyanine B (GEN)	1.0%	Wool	3	2	758
Indocyanine B (GEN)	5.0%	Wool	5	2	757
Kiton Fast Red BL (CIBA)	0.2%	Wool	3	1	738
Kiton Fast Red BL (CIBA)	1.0%	Wool	4	1	737
Kiton Fast Red BL (CIBA)	5.0%	Wool	5	1	736
Kiton Fast Red 4BL (CIBA)	1.0%	Wool	4	1	1438
Kiton Fast Red 4BL (CIBA)	2.0%	Wool	4	1	1439
Kiton Fast Red 4BL (CIBA)	5.0%	Wool	5	1	1440
Kromeko Yellow CGW (CAMP)	0.25%	Wool	3	4	1408
Kromeko Yellow CGW (CAMP)	0.5%	Wool	3	4	1409
Kromeko Yellow CGW (CAMP)	1.0%	Wool	4	4	1410
Kryogene Violet 3R (GEN)	20.0%	Cotton	2	8	1498
Kryogene Violet 3RX (GEN)	1.0%	Cotton	1	8	276
Kryogene Violet 3RX (GEN)	4.0%	Cotton	1	8	275
Light Fast Brown 3YL (NEW)	0.5%	Cotton	2	1	102
Light Fast Brown 3YL (NEW)	2.0%	Cotton	3	1	101
Light Fast Brown 3YL (NEW)	0.5%	Silk	3	3	72
Light Fast Brown 3YL (NEW)	2.0%	Silk	3	3	71
Metachrome Blue Black 2BX (GEN)	0.5%	Wool	3	6	783
Metachrome Blue Black 2BX (GEN)	1.0%	Wool	4	6	782
Metachrome Blue Black 2BX (GEN)	3.0%	Wool	5	6	781
Milling Yellow O (GEN)	0.2%	Wool	2	2	726
Milling Yellow O (GEN)	1.0%	Wool	3	2	725
Milling Yellow O (GEN)	2.0%	Wool	5	2	724
Naphthochrome Violet R (CIBA)	0.5%	Wool	2	5	573
Naphthochrome Violet R (CIBA)	1.0%	Wool	2	5	572
Naphthochrome Violet R (CIBA)	2.0%	Wool	3	5	571
Naphthol AS and Fast Blue B Salt (GEN)	—	Cotton	2	10	940
Naphthol AS and Fast Orange R Salt (GEN)	—	Cotton	3	10	941
Naphthol AS and Fast Red 3GL Salt (GEN)	—	Cotton	5	10	353
Naphthol ASBG and Fast Scarlet 2G Salt (GEN)	—	Cotton	5	10	350
Naphthol ASBR and Fast Scarlet 2G Salt (GEN)	—	Cotton	5	10	343
Naphthol ASD and Fast Scarlet R Salt (GEN)	—	Cotton	4	10	1373
Naphthol ASG and Fast Scarlet 2G Salt (GEN)	—	Cotton	3	10	349
Naphthol ASRL and Fast Red B Salt (GEN)	—	Cotton	5	10	344
Naphthol ASRL and Fast Red GL Salt (GEN)	—	Cotton	6	10	351
Naphthol ASRL and Fast Red RL Base (GEN)	(Pink)	Cotton	4	10	346
Naphthol ASRL and Fast Red RL Base (GEN)	—	Cotton	5	10	345
Naphthol ASRL and Fast Scarlet G Base (GEN)	—	Cotton	5	10	352
Naphthol ASRL and Fast Scarlet 2G Salt (GEN)	—	Cotton	5	10	347
Naphthol ASSW and Fast Black LB Base (GEN)	—	Cotton	5	10	1372
Naphthol ASSW and Fast Red KB Base (GEN)	—	Cotton	4	10	348
Neolan Blue 2G (CIBA)	0.2%	Wool	3	1	753
Neolan Blue 2G (CIBA)	1.0%	Wool	4	1	752
Neolan Blue 2G (CIBA)	5.0%	Wool	5	1	751
Neolan Green B (CIBA)	0.2%	Wool	3	1	1307
Neolan Green B (CIBA)	1.0%	Wool	3	1	1308
Neolan Green B (CIBA)	5.0%	Wool	4	1	1309
Neolan Orange R (CIBA)	0.2%	Wool	4	1	1313
Neolan Orange R (CIBA)	1.0%	Wool	5	1	1314
Neolan Orange R (CIBA)	5.0%	Wool	6	1	1315
Neolan Red 3B (CIBA)	0.2%	Wool	3	1	1322
Neolan Red 3B (CIBA)	1.0%	Wool	3	1	1323
Neolan Red 3B (CIBA)	5.0%	Wool	5	1	1324
Neolan Yellow R (CIBA)	0.2%	Wool	3	1	1319
Neolan Yellow R (CIBA)	1.0%	Wool	4	1	1320
Neolan Yellow R (CIBA)	5.0%	Wool	5	1	1321
Niagara Fast Blue RL (NA)	0.5%	Cotton	3	1	1352
Niagara Fast Blue RL (NA)	2.0%	Cotton	3	1	1353
Omega Chrome Brown R (SAN)	1.0%	Wool	2	4	1377
Omega Chrome Brown R (SAN)	2.0%	Wool	3	4	1378
Omega Chrome Brown R (SAN)	5.0%	Wool	5	4	1379
Polar Maroon V Conc. (GEI)	0.5%	Silk	2	1	925
Polar Maroon V Conc. (GEI)	2.0%	Silk	3	1	924

(Table I—*Continued*)

Dye Name and Manufacturer	Amount	Fiber	Fastness Class	Dyeing Method	Serial Number
Polar Red B Conc. (GEI)	0.5%	Silk	2	1	870
Polar Red B Conc. (GEI)	2.0%	Silk	3	1	871
Pontacyl Light Red BL (DP)	1.0%	Wool	4	1	1441
Pontacyl Light Red BL (DP)	2.0%	Wool	4	1	1442
Pontacyl Light Red BL (DP)	5.0%	Wool	5	1	1443
Pontacyl Light Red BL (DP)	0.5%	Silk	3	1	923
Pontacyl Light Red BL (DP)	2.0%	Silk	4	1	922
Pontamine Brilliant Violet B (DP)	0.5%	Cotton	0	1	1344
Pontamine Brilliant Violet B (DP)	2.0%	Cotton	0	1	1345
Pontamine Copper Blue RRX (DP)	0.25%	Cotton	0	1	140
Pontamine Copper Blue RRX (DP)	1.0%	Cotton	1	1	139
Pontamine Copper Blue RRX (DP)	0.25%	Cotton	2	6	138
Pontamine Copper Blue RRX (DP)	1.0%	Cotton	3	6	137
Pontamine Diazo Brown R (DP)	0.5%	Cotton	2	2	1350
Pontamine Diazo Brown R (DP)	2.0%	Cotton	3	2	1351
Pontamine Diazo Brown R (DP)	0.5%	Cotton	3	3	1348
Pontamine Diazo Brown R (DP)	2.0%	Cotton	3	3	1349
Pontamine Diazo Brown 6G (DP)	0.5%	Cotton	0	2	35
Pontamine Diazo Brown 6G (DP)	2.0%	Cotton	1	2	36
Pontamine Diazo Orange (DP)	0.5%	Cotton	1	2	33
Pontamine Diazo Orange (DP)	2.0%	Cotton	1	2	34
Pontamine Diazo Orange (DP)	4.0%	Silk	2	7	500
Pontamine Diazo Red 7BL (DP)	0.5%	Cotton	1	2	3
Pontamine Diazo Red 7BL (DP)	2.0%	Cotton	2	2	4
Pontamine Diazo Red 7BL (DP)	4.0%	Silk	3	7	493
Pontamine Fast Black LN (DP)	0.5%	Cotton	1	1	47
Pontamine Fast Black LN (DP)	2.0%	Cotton	3	1	48
Pontamine Fast Orange EG (DP)	0.5%	Cotton	2	1	272
Pontamine Fast Orange EG (DP)	2.0%	Cotton	3	1	271
Pontamine Fast Orange EG (DP)	0.5%	Silk	2	3	476
Pontamine Fast Orange EG (DP)	2.0%	Silk	3	3	475
Pontamine Light Gray GG (DP)	0.5%	Cotton	2	1	1342
Pontamine Light Gray GG (DP)	2.0%	Cotton	2	1	1343
Pyrogen Green GK (CIBA)	1.0%	Cotton	2	8	929
Pyrogen Green GK (CIBA)	4.0%	Cotton	2	8	928
Radio Chrome Blue B (GEN)	1.0%	Wool	2	4	1383
Radio Chrome Blue B (GEN)	2.0%	Wool	4	4	1384
Radio Chrome Blue B (GEN)	5.0%	Wool	4	4	1385
Rosanthrene Orange R (CIBA)	0.5%	Cotton	0	2	31
Rosanthrene Orange R (CIBA)	2.0%	Cotton	0	2	32
Rosanthrene Orange R (CIBA)	0.5%	Cotton	1	3	29
Rosanthrene Orange R (CIBA)	2.0%	Cotton	1	3	30
Rosanthrene Orange R (CIBA)	4.0%	Silk	1	8	498
Serichrome Green B (NA)	0.5%	Wool	1	4	585
Serichrome Green B (NA)	1.0%	Wool	1	4	584
Serichrome Green B (NA)	2.0%	Wool	2	4	583
Solantine Brown R (NA)	0.5%	Cotton	2	1	1354
Solantine Brown R (NA)	2.0%	Cotton	3	1	1355
Solantine Brown R (NA)	0.5%	Silk	3	3	1465
Solantine Brown R (NA)	2.0%	Silk	4	3	1466
Solantine Red 8BLN (NA)	0.5%	Cotton	1	1	1346
Solantine Red 8BLN (NA)	2.0%	Cotton	2	1	1347
Solantine Violet R (NA)	0.5%	Cotton	3	1	49
Solantine Violet R (NA)	2.0%	Cotton	4	1	50
Solantine Violet R (NA)	0.5%	Silk	2	3	254
Solantine Violet R (NA)	2.0%	Silk	3	3	253
Sulfogene Brilliant Blue GG Conc. (DP)	1.0%	Cotton	2	8	935
Sulfogene Brilliant Blue GG Conc. (DP)	4.0%	Cotton	3	8	934
Sulfogene Cutch O (DP)	1.0%	Cotton	2	8	937
Sulfogene Cutch O (DP)	4.0%	Cotton	3	8	936
Sulfogene Dark Brown GN Ex. (DP)	1.0%	Cotton	3	8	933
Sulfogene Dark Brown GN Ex. (DP)	4.0%	Cotton	4	8	932
Sulfogene Indigo Blue G Conc. (DP)	1.0%	Cotton	1	8	286
Sulfogene Indigo Blue G Conc. (DP)	4.0%	Cotton	3	8	285
Sulphur Olive G (GRAS)	1.0%	Cotton	2	8	282
Sulphur Olive G (GRAS)	4.0%	Cotton	4	8	281
Sulphur Yellow 2G (NEW)	1.0%	Cotton	1	8	292
Sulphur Yellow 2G (NEW)	4.0%	Cotton	2	8	291
Supramine Yellow R (GEN)	3.0%	Wtd. Silk	4	2	1478
Toluylene Fast Orange GL (GEN)	0.5%	Silk	2	3	900
Toluylene Fast Orange GL (GEN)	2.0%	Silk	3	3	899

TABLE 2

ABBREVIATIONS OF MANUFACTURERS' NAMES

AAP—American Aniline Products, Inc.
BDC—British Dyestuffs Corporation, Ltd.
CAL—Calco Chemical Company.
CAMP—John Campbell & Co.
CENT—Central Dyestuff & Chemical Company.
CHEM—Chemical Company of America.
CIBA—Ciba Company, Inc.
DAV—Albert David Chemical Company.
DH—Durand, Huguenin & Co.
DP—E. I. du Pont de Nemours & Co.
GARF—Garfield Aniline Works.
GEI—Geigy Company, Inc.
GEN—General Dyestuff Corporation.
GRAS—Grasselli Dyestuff Corporation.
LAM—Lamie Chemical Co.
NA—National Aniline & Chemical Company, Inc.
NEW—Newport Chemical Works, Inc.
PEER—Peerless Color Company.
PHAR—Pharma-Chemical Corporation.
SAN—Sandoz Chemical Works.
SCOT—Scottish Dyes, Ltd.
US—United States Color & Chemical Company.
ZIN—Zinsser & Co.

TABLE 3

LIST OF DYEING METHODS

COTTON

1. Direct, dyed with salt.
2. Same as No. 1, but diazotized and developed with beta-naphthol.
3. Same as No. 1, but diazotized and developed with developer Z, phenylmethyl pyrazolone.
4. Same as No. 1, but diazotized and developed with chloride of lime.
5. Same as No. 1, but diazotized and developed with developer H, meta-phenylenediamine.
6. Same as No. 1, but aftertreated with copper sulphate.
7. Vat, dyed with caustic soda and hydrosulphite.
8. Sulphur, dyed with sodium sulphide, soda ash and salt, and aftertreated with chrome.
9. Basic, dyed on a tannin mordant.
10. Insoluble azo dyes, coupled on the fiber.
11. Aniline Black, prussiate black, not chromed.
12. Indigosol, padded and developed with nitrous acid.
13. Same as No. 7, but aftertreated with chlorine.
14. Mordant dyes.

WOOL

1. Acid, dyed with sulphuric acid and Glauber salt.
2. "Direct dyeing," dyed with sulphuric, acetic or formic acid, or ammonium acetate.
3. Substantive, dyed with Glauber salt.
4. Afterchromed.
5. Mordant dyes, on a chrome mordant.
6. Chromate dyes, dyed with chrome in the bath.
7. Indigosol, developed with nitrous acid.
8. Indigosol, developed with chrome.
9. Vat, dyed in a hydrosulphite vat.

SILK AND WEIGHTED SILK

1. Dyed with sulphuric acid.
2. Dyed with acetic acid.
3. Dyed with acetic acid and Glauber salt.
4. Dyed with soap.
5. Dyed with soap and Glauber salt.
6. Vat, dyed with caustic soda and hydrosulphite.
7. Same as No. 3, but diazotized and developed with beta-naphthol.
8. Same as No. 3, but diazotized and developed with developer Z, phenylmethyl pyrazolone.
9. Same as No. 3, but diazotized and developed with developer H, meta-phenylenediamine.
10. Same as No. 6, but oxidized with nitrous acid.
11. Mordant dyes, on an iron mordant.
12. Dyed with boiled-off liquor acidified with sulphuric acid. Brightened with sulphuric acid.
13. Dyed with boiled-off liquor acidified with acetic acid. Brightened with acetic acid.

Correction

In the discussion of the paper "Recent Developments in Printing Thickeners" by Thomas Harris which appeared in the April 27th issue, we have been requested to make the following corrections: Page 279, column 2, lines 26-27—omit the word "tosulinth" making it read "the substance which is something like Basorin." On same page, line 36—change "because they wouldn't boil" to read "because they wouldn't work." Page 280, column 1, line 27, change "one thing that may help you is the addition of Borax" to "one thing that may help you is to observe the action of Borax." Then add, "Those textile Gums which show the most reaction with Borax seem to be the most affected by Chrome Acetate."

In the remarks by Mr. Harris, "British Gum Trag" was put in as "Butil Gum Jug."

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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MR. MELLON'S ADVICE

IT would be distinctly worth while for every man associated with twentieth century American industry to pause a few moments to read the address of Secretary Mellon before the foreign bankers during the recent International Chamber of Commerce session in Washington.

Common sense and clear thinking predominated each of his remarks. Mr. Mellon looked at the present industrial situation through eyes more keenly adjusted to the economic fluctuations of the present-day world than most anyone in this country. His emphasis upon a gradual and well-founded program of stabilization was in every sense well conceived.

Mr. Mellon recalled to mind that, following a world-wide and exhaustive economic crisis in the decade of 1910-1920, comprehending as it did the avalanche of the world war and its immediate effects, America now has passed through another decade of unprecedented industrial and economic progress. As he says, wars invariably cause monetary inflation and rise in prices, followed by a period of rather unorganized industrial activity and entirely too rapid and ill-balanced expansion in all directions, which, naturally enough, lead any country, in the end, to the production of goods and services incommensurate to the world's contemporary capacity to absorb the same. Eventually, a readjustment has to be effected. "Prices must be revised, and cost of production and output must be brought down to a point where the demand will again be stimulated and goods will move into consumption. In short, a balanced condition must be restored"; (and *this is a vital point indeed*) "and this may be done without a general reduction of wages, provided the period of readjustment is not too long drawn out, and on conditions also that we reduce costs by yet greater efficiency in labor, in management, and in distribution."

Throughout this, our attention is called to the fact how vitally essential it is that we maintain our equilibrium both through our sense of perspective and confidence that experience should be constructive. A crisis, such as the present one, is not an ill-born period without precedent. Rather, it is what might have been predicted over ten years ago. The whole world seems to be emerging, and that word is used with its full significance, from one of those transition stages which arrive periodically and which entail and demand drastic and far-reaching economic readjustments.

Bearing in mind Mr. Mellon's emphasis throughout his whole talk that our present experience indicates that no machine is capable of perpetually operating and functioning at top speed all the time, it might be well to repeat here his final admonition to the world delegates:

"No one should be discouraged about the ultimate outcome. We are, as I said at the beginning, passing through a transition period, and such periods are always difficult to understand because we are too close to events to see the direction in which they are moving or to discern the outline of developments which will characterize the new era.

"But anyone who has witnessed the new inventions, the birth of new industries, the acceleration of production and consumption, and the structural changes which have so vastly increased the wealth of the world and altered our entire mode of living within the entire memory of those present, cannot be discouraged about either the immediate or the distant future. The opportunities which have so multiplied in the last generation are only the forerunners of others, and perhaps greater ones, which will come as the result of forces now at work and constantly being discovered, so that it is impossible to predict what may be the opportunities that lie immediately ahead.

"I have no means of knowing when or how we shall emerge from the valley in which we are now traveling. But I do know that, as in the past, the day will come when we shall find ourselves on a more solid economic foundation and the onward march of progress will be resumed."

FINANCIAL CONTROL

THE importance of proper allocation of manufacturing costs, and of financial control by the individual silk manufacturer as a means of bringing the silk industry back to prosperity was emphasized by Fred W. Shibley, vice-president of the Bankers Trust Company, speaking recently before members of the cost calculation and budgetary control committee of the Silk Association of America, Inc. Mr. Shibley is adviser to this committee which is engaged in a study of cost methods as a part of the general research program now being undertaken by the silk industry.

When a financial control system is adopted by the silk manufacturer, Mr. Shibley said, he will know where he is going wrong and how to get back on the charted path. A financial control system shows where losses occur, and points out the way to remedy conditions. A firm with no system of financial control is likely to be misled as to costs, and such lack of knowledge eventually reflects in the balance sheets.

Recommendation of a system of financial control for the individual use of silk firms will be undertaken by the budgetary control and cost calculation committee. It is proposed to construct a theoretical organization with a definite loom capacity to produce a definite number of yards of goods, and to apply the system to this company, from the initial stage of planning the line to the final disposal of manufactured goods.

All costs entering into operations will be shown from the original purchase of raw silk through the different processes. Non-technical language will be used in this study, which will be extensively illustrated with practical examples. The needs of both larger and smaller units will be considered so that the study will be usable by every member of the industry.

Output of British Dyestuffs

A substantial decline in the output of British dyestuffs during 1930 is indicated by figures just published by the Board of Trade, and fully 70 per cent of the decreased production is accounted for by the smaller quantities taken by the textile industries. The output of all kinds of dyes in 1930 was 42,590,243 lbs., whereas in 1929 the production was 55,785,032 lbs., or 13,000,000 lbs. more than last year. The biggest decline in 1930 was in vat colors including indigo—from 14,683,701 lbs. to 9,068,263 lbs.—blues alone falling from 12,977,825 lbs. to 7,559,707 lbs. Direct cotton colors fell from 7,388,725 lbs. to 6,716,291 lbs., acid wool colors from 7,425,330 lbs. to 6,449,530 lbs., chrome and mordant colors, including alizarine, from 9,614,734 lbs. to 6,878,865 lbs., sulphur colors from 6,864,243 lbs. to 5,231,954 lbs., and a group consisting of cellulose acetate silk, oil spirit and wax, and unclassified colors from 5,394,294 lbs. to 4,531,896 lbs. The other classes enumerated were comparatively unimportant.

Hellwig's Offices Moved

Their present building program completed, The Hellwig Silk Dyeing Company's offices have been removed to their Wissinoming Plant.

This concentration has been planned for some time to further facilitate the service and personal supervision necessary and to improve shipments.

The Wissinoming Plant, situated along the Delaware River with railroad sidings on the New York Branch of the Pennsylvania Railroad, is equipped with all the most modern machinery. It houses the skein and piece dyeing, also the printing and finishing departments.

British Chemical Plant Exhibition

The arrangements for the representative exhibition of British Chemical Plant and Equipment which is to be held at Central Hall, Westminster, London, during the week of the Jubilee Celebrations of the Society of Chemical Industry from 13th-18th July, inclusive, are now practically complete. The whole of the available space has been booked with the greatest ease, thus showing the wide appeal which the exhibition has made to makers of British chemical plant. Some fifty firms, among whom are the most important manufacturers of plant in the country, will be exhibiting a wide range and variety of products, while the Technical Press will be well represented. Practically every type of chemical apparatus will be on show including autoclaves; centrifugal separators, extractors and dryers of continuous and intermittent types; chemical stoneware including acid-proof stoneware for tanks, pipes and taps, acid-proof bricks and tiles; distillation plant of all kinds; dryers; electrolytic cells; emulsifiers; evaporators; extraction apparatus; filter presses in a variety of designs; pans of various types; tank linings of various resistant materials, and valves, to mention only a few. There will be numerous exhibits of chemical plant and equipment in special constructional materials such as aluminum, brass, copper, nickel, stainless steel and stoneware, designed to meet a great variety of purposes.

Recent Publications of Mellon Institute

Mellon Institute of Industrial Research, Pittsburgh, Pa., has just issued the Fourth Annual Supplement to its Bibliographic Bulletin No. 2. This supplement lists the books, bulletins, journal contributions, and patents of the institution's members during the calendar year 1930.

The Institute has also published the *18th Annual Report* of its director, Dr. E. R. Weidlein, to the board of trustees of the institution, which describes the investigational activities throughout the fiscal year, Feb. 28, 1930, to Feb. 28, 1931.

Complimentary copies of these booklets will be sent to research workers, science teachers, and librarians upon request.

Addition to Swann Corporation

F. W. Miller, formerly Vice President of Rogers Brown & Crocker Bros., Inc., has been appointed Vice President of Swann Chemical Company. He will have charge of the Cincinnati Office of this company. J. R. Morehead, who was assistant to Mr. Miller in his previous position will continue in that capacity with Mr. Miller in the new company.

General Dyestuff Corporation is sending out circulars on Brilliant Benzo Blue 6 B A Conc. which is manufactured by the General Aniline Works. It is said to be a very bright shade of greenish blue, well suited for dyeing cotton or rayon and also pure silk from an acetic acid bath. G-66.

Training Chemists

(Continued from page 356)

tact with many people who have been in industry for many years and whose opinion is to be valued. He can see in the accomplishment and position of others what is potentially ahead of him. It will be a test of his patience and also his faith in himself and this is an essential part of his training.

On the other hand, it offers those in charge of the work an opportunity to size him up and to determine what sort of a person he is and what his capabilities seem to be. It will be determined to what degree he has the ability and desire to apply himself, how ingenious he is, and the extent to which he is able to cooperate with those around him. In the course of a few months it will be evident whether he is able to go ahead or whether his chances of advancement are poor and a change would be desirable. His work in this section lasts for varying periods of time, depending on the rate of his development and on the requirement for men in other lines of work which I will describe.

The work of the research divisions is classified under various categories such as (a) control of going processes, (b) improvement of going processes, (c) additions to present lines, (d) new ventures, and lastly, (e) fundamental research in pure or applied chemistry. The percentage of the total research force delegated to these categories varies, but in general comparatively little work is carried out in categories (a) and (b); a predominant amount in (c); an increasing amount in (d) and only a moderate amount in (e). Since the majority of the work of the research divisions is of a purely developmental nature, requiring expert technique and extensive background of experience, it is obvious that it is essential to have it carried out either by or under the immediate direction of the older men. In order to replace those who drop out or to make it possible to increase the volume of this work it is necessary to add to the force from time to time. At present this is done in two ways. It is our custom to have new Ph.D.'s go directly into the research divisions. The second source of new men is the analytical section which I have described. The choice of a man from the analytical division is made first, in order of seniority, and second, on individual qualifications for the position that is open. It is attempted to place the man where he apparently will be happiest and be in a position to develop best and become most valuable both from his own and the company's standpoint.

I might take this occasion to say that personally I believe it would be to the ultimate advantage of the Ph.D. if he too could be given training in the analytical division since the analytical approach to research problems has been demonstrated to be most fruitful. So far we have not been able to devote the necessary time to this training of Ph.D. chemists. In either case the new man starts to work with one of the older chemists. At first he is given a series of reactions or processes to carry out. He is closely watched and where faulty, his technique is corrected. Within a reasonable period of time he is able to do the work satisfactorily and is then ready for research and development work on new processes. For some time this is carried out under the direction of the older man, but finally when obviously qualified, the new chemist is ready to go it on his own, reporting directly to the Division Head. The length of this training varies according to the individual and is usually longer for the four and five year men than for the Ph.D.'s.

During this period of training, it is of greatest importance that the chemist realize his lack of knowledge and capitalize to the utmost the expert guidance which is at his disposal. He should approach his task with an aggressive desire to learn and should thoroughly study the literature pertaining to his field. He learns the controlling factors in obtaining high yields and good quality and is able to choose those methods which have the best economy both considered alone and in connection with other products being manufactured. His growth is in his ability to quickly arrive at the solution of a problem, while at the same time choosing that procedure which is fundamentally of greatest economy. He is a pioneer and his efforts frequently result in patentable processes which constitute the basis of a monopoly which in turn yields the richest profits. He should learn to analyze a problem and to systematically plan his work so that to a large extent his actual experiments are to confirm an idea or fact rather than that from a large number of experiments he should be able to deduce a fact. It is not by any means a training solely in the use of his hands or in the accumulation of a fund of highly specialized facts. It is a period of mind training which is a continuation of that training which the college should really aim to give its students.

It takes all kinds of men to make the world and this is fortunate. Some of the research chemists will always be individual workers while others exhibit the ability to handle many problems and ultimately are able to go into managerial positions. It should not be assumed, however, that financial success is predicated solely on being able to go into executive work. Some of the most inventive chemists are those who shun personal contacts and office work. They contribute in an important way to the success of the developmental work. We could not get along without the genius. It is desirable, however, to live harmoniously with others and the ability to cooperate is a vital part of the chemists' training. Too often an individual gets the idea that he can go it alone but finds in the end that he *is* alone and pretty much out of the picture. Individual effort persists until his extensive background and his outstanding organizing ability fit him to lead others and direct their work in a more coordinated whole. He then becomes a section leader, or an assistant division head—later a division head, then assistant laboratory director and then laboratory or chemical director.

Another phase of the activities of the chemist in the Dyestuffs Department is in connection with the manufacturing end of the business. The plant is organized along

lines very similar to those I have described in the research laboratory. It is composed of areas, again based on the natural divisions of the work. Roughly, these manufacturing areas correspond in subject matter to the divisions of the research laboratory. Each area has its own control laboratory in which the routine analysis of raw, semi-finished and finished materials is carried out as well as a certain amount of research work designed to improve the efficiency of the various operations. These laboratories handle the bulk of category (a) work and a fair proportion of (b).

Long ago it was decided that the manufacturing operations could be carried on most efficiently by highly trained chemists and the results in the last 12 years have amply substantiated this belief. We find, therefore, in the plant organization, a large number of chemists. Some are in the plant laboratories and some are in actual charge of one or more operations. Most of the chemists in the plants came from the research laboratories, a few having been taken in from outside of the Company by virtue of experience gained with other companies. Many of the operating chemists were formerly in charge of divisions in the research laboratory and their collegiate training ranges from the four year degree to the Ph.D. New chemists are obtained from either the analytical or research divisions of the research laboratory depending on the nature of the position to be filled. When they arrive they are familiar in a general way with the handling of large operations but must be trained in the particular processes being operated. Eternal vigilance to detail, the rigid control of purity, the prevention of mechanical loss, the efficiency of labor, the health and safety of the men, the economical treatment of repairs and replacements—all these must be mastered and much can be learned from the guidance and training given by the older men. Here, perhaps more than in the research laboratory it is necessary to develop proper human relationships. The plant chemist has to deal with the research man who develops and hands over to him a process that is supposed to work. He must check it to be certain that he personally can operate it and obtain the desired results. He must maintain the proper contacts with the service departments so that his materials are on hand and his equipment in good operating condition. He must maintain the right spirit in his workmen. He must satisfy his superiors that maximum efficiency and minimum costs are realized. He must keep in touch with the technical and sales departments to make certain that he understands their requirements and delivers the desired amounts of products of high quality. Many times he contacts the customer in order to appreciate his needs or to solve the difficulties with the products he has sold.

The plant chemist grows in direct proportion to his ability to obtain high efficiency and this in turn is a direct reflection of his ability along the lines of chemistry, co-operation, originality, energy and integrity. His route of progress is from assistant supervisor of one operation to complete charge of it—then to several operations, next an entire building, then an area of related products, then general production or chemical superintendent, assistant plant manager and finally plant manager. It is a route of constantly increasing responsibility and effort and, of course, of increasing recognition and financial return. His success depends on himself first of all but next on his training and to this extent his employer is responsible for his success. His progress is beset by trials and tribulations, it is sweetened by the thrill of achievement, life-long friends are made, independence is acquired and a satisfaction comes from the knowledge that one's best efforts have been expended and the goal reached to the best measure of one's ability.

Objection to Group Insurance for Chemical Manufacturers

By W. F. SCHAPHORST, M.E.

IN VIEW of the fact that most chemical manufacturers are more or less interested in group insurance I am sure that many readers will welcome the following information which is the experience of one of my clients with this type of insurance:

While business was good with my client and all of his employees worked day after day, month after month, and year after year, the group insurance plan seemed to be all right. But the deplorable "depression" came along and as a result it was necessary to drop employees one by one so that finally very few workers were left. Under the circumstances it was both expensive and impracticable to continue to carry the insurance on employees who were not working for the concern. The employer found it impossible to keep in touch with his former employees, many of whom were in other cities, working at other trades, and were not interested in keeping up payments on their insurance. Others who were not working could not make payments even if they wanted to. The only sensible thing to do, therefore, was to cancel the policy, and that is what my client did. Of course the insurance company was the gainer while my client and his employees were the losers. All money that they had put into the policy was lost to them because the policy did not have a cash surrender value at the time of cancellation. To be sure conditions of this kind may not be experienced in every instance, but the possibility of their repetition should be given consideration before going into any kind of insurance contract.

I believe in and carry insurance myself. There is a "right kind" for nearly every situation. The above is simply offered in the spirit of helpfulness.

The Neutrasol Products Corporation, who formerly had their offices at 41 Park Row, New York, announce that their new address will be at their new factory at 39 Cornelison Avenue, Jersey City, New Jersey.

Technical Notes from Foreign Sources

Indigosols in Wool-Dyeing

G. Rudolph—Monats. f. Textil-Ind. 45,216 (1930). —When the first Indigosol became known some years ago, it was a discovery which well merited the surprised welcome which it received. At first, one hardly knew what could be done with a new product which would dye wool blue. We already had indigo at our disposal, and this could of course be replaced by the new product, but this one replacement was not enough to justify very far-reaching hopes. But the rise of the Indigosols may be compared with that of the Helindones, which from one representative grew to a group containing more and more new color-tones, available for vat-dyeing upon wool, with results fully free from criticism.

It was to be expected that the first Indigosols would branch out, so to speak, into other further products, and this has been the case. We can now dye with the products of this group an astonishing number of tones, strikingly fast. A uniform method of application became needed for their extended use, and this method is now available.

There are yellows, scarlets, pinks, reds, violets, reddish blues, greenish blues, blues, and greens. These various brands are estimated as to shade by 2 per cent dyeings. For all gray, leather, brown, and reseda tones, mixtures of the brands O4B, Red HR, and Golden Yellow JGK are used. For a distinct red tone, Scarlet HB is employed. Clear resedas or olives inclining toward green are dyed with O6B and Golden Yellow JGK, or with the latter and Green AB. (The prefixed general title "Indigosol" is of course understood with these titles.) With the last two, lively yellowish greens can be produced, while for dark greens O4B or AZG with Golden Yellow JGK may be used; and we can darken the tone with Red HR or brighten it with Green AB.

For red tones, the type-dyestuffs are sufficient. If darker reds or Bordeaux are to be produced, O4B is added in sufficient amount for the effect wished. For blues there are sufficient brands available, and these can be used for shading as well. If we wish, a bluish-violet tone, Red Violet JRH is mixed with O4B.

By observing the necessary precautions, level dyeings can easily be obtained. We dye loose wool, etc., in the machine, but dyeing can also be carried out in open vessels. Machine dyeing is always advisable, however, because of the shorter bath-ratio possible.

The following details hold good for the dyeing of 100 kilos of uncarbonized wool, loose or combed:

1—Preparation of material and bath:

The goods are well wetted out with water of 40°C. If the presence of alkali is suspected, perhaps originating in the washing, we add 250-500 g. (0.25-0.5 per cent) of acetic acid. After the bath has circulated from 10-15 minutes, the following additions are made.

2—1 kilo (1 per cent) of ammonium sulphocyanide, if the apparatus contains copper parts.

3—The dyestuff, dissolved in water of 90-95°C. (not to be boiled).

4—For light tones, 1-2 kilos (1-2 per cent) of ammonium sulphate.

For medium tones, 2.5-5 kilos (2.5-5.0 per cent) of ammonium sulphate.

For dark tones, 6-10 kilos (6-10 per cent) of ammonium sulphate.

Before addition, the above is to be dissolved in hot water.

5—For light, delicate tones, 0.25 kilos (0.25 per cent) of acetic acid of 80 per cent.

For medium, delicate tones, 0.5-1.0 kilo (0.5-1.0 per cent) of acetic acid of 80 per cent.

For dark, delicate tones, 2.0-3.0 kilos (2.0-3.0 per cent) of acetic acid of 80 per cent.

ing continued for 30-45 minutes.

It is to be noted carefully—in many cases the bath may be exhausted with the above amount of acid. To be assured of whether or not this is the case, or whether dyestuff is still present, a little of the bath is withdrawn in a test tube, and this sample treated with 10-15 drops of a dilute sulphuric acid (6.6 g. of 66°Bé. acid and 100 cc. of water), and then with 1 drop of a 1 per cent sodium nitrite solution. The sample is then heated for a minute at 90°C. If it remains clear, the dyestuff is no longer present in the bath—the bath is exhausted; if it is colored or cloudy, the bath still contains dyestuff. In this case, 2-3 kilos (2-3 per cent) of the acetic acid are added further, best through some sort of dropping apparatus, so as to be sure that its entry into the bath is not too rapid; and the goods are dyed for about 15 minutes longer. Non-leveling can occur only when too much acetic acid is present from the very beginning of the dyeing. In the case of carbonized wool, which has not been neutralized, or only imperfectly so, that is, material which is more or less acid to start with, we do not begin with ammonium sulphate and acetic acid, but with 1-2 kilos (1-2 per cent) of ammonia water. Testing the bath as above will show whether acetic acid must be added in order to exhaust the bath.

2—Oxidation: The bath is cooled down, within 15-20 minutes, to 30°C., and so effectively that the interior of the goods also shows the same temperature. The oxidation is carried out with potassium chromate and sulphuric acid. First, the potassium chromate is added,

in solution, at 30°C. The smallest amount which is to be used, even with the lightest shades, is 1 kilo (1 per cent). For dyestuff ratios of 1-2 kilos (1-2 per cent), 1-2 kilos of chromate are used; for values of 2-5 kilos, 2.5 kilos of chromate (2.5 per cent), are needed. After the bath has circulated for 15 minutes at 30°C., 10 kilos (10 per cent) of sulphuric acid of 66°Bé., previously greatly diluted with cold water, are added gradually. As soon as all of the acid has been entered, the temperature is raised to 85°C., and kept there for 30-40 minutes. The quantity of acid needed, being dependent upon that of the chromate, is the same for any depth of shade.

The oxidizing bath must be as short as possible, so that the fixing of the color may take place quickly and surely. If one has to work in open tubs with a longer bath, the amount of acid is best calculated on the bath-percentage basis, at 100 g. of sulphuric acid per 10 liters of bath. At first, the bath appears yellow, due to the potassium chromate; toward the end, it should take on a bluish-green color, as the chromate is reduced to chrome alum.

After oxidation, the material is rinsed well, and best neutralized with soda. Neutralization is especially necessary in those cases where the combed or the loose wool is to be worked up into goods to be washed and fulled. A good neutralization, washing, or fulling contributes to the increase of the fastness to light.

The fastness properties of the Indigosols are considered as excellent. They are, one should expect, of the same value as those of the original vat dyestuff from which they were originally synthesized, since the latter are simply regenerated in the fiber in the oxidation-process.

Vat Dyestuffs, Anthraquinone Series

German Patent No. 440,891 (21/*II*/27)—*I.G. Farben-Ind. A.-G.*—Diamino-anthraquinones or their substitution products are reacted with aromatic p-quinones or their derivatives (including their halogen derivatives). These condensation products are then acylated. A possible variation is to acylate the diamino-anthraquinone first, in one amino-group only, and then to accomplish the reaction with the quinone chosen. The acylation results in the products being of much greater affinity for the fiber, fast to washing, light, and chlorine; they are in part valuable dyestuffs for wool and cotton, and are in part suitable for working up into other more complex dyestuffs of the same class. The tones of the products cited are from orange through bordeaux to brown or red-brown. On wool, they are also fast to fulling.

German Patent No. 267,414 cites a sort of halfway product, from the condensation of 1-5-diamino-anthraquinone with a-naphthoquinone; but this product has little affinity for the fiber, and is unfast to chlorine, washing, and light. It seems to be the acylation which accomplishes the greater stability of the products, a change well-known in other cases also.

Characteristics and Analysis of Cellulose Acetates

R. Staz. Sper. per l'Ind. delle Pelli e delli Mat. Conc. (in I Prog. n. Ind. Tint. e Tess. 28, 420) (1929).—A useful 1½ page resume of the subject, of which too little is yet known, or at least collectively published, to be convenient.

Chemical Degradation of Cellulose

Pringsheim, Otto, and Katz—Cellulose-Chemie 11,137 (1930).—Agfa acetate silk was treated with anhydrous benzene-sulphonic acid in chloroform as a medium, containing 2% of absolute alcohol, the amounts of the acid in different experiments being 0.25, 0.50, and 1.0%. Through boiling in these solutions the cellulose acetate was saponified, the process being, when necessary, completed with aqueous ammonia.

The two products formed, A and B, were tested as to their optical rotation. They were then re-acetylated, and these products also tested for the same value. Results obtained were decisively different from those for cellulose and for its acetate. According, however, to X-ray studies, the spectrum of product A, which was unquestionably different in structure from cellulose A, the common, alkali-soluble cellulose, was identical with that of the latter, and also with that of biosane, as determined by Hess and Friese. This remarkable fact, that the X-ray spectra of these three substances of such different molecular weight, are identical, is at present without explanation.

Dyeing of Cotton-Silk and Wool-Silk Unions

G. Rudolph—Kunst-Seide 12,364 (1930).—A continuation of the topic from an earlier installment. This portion takes up the topics of basic dyestuffs, sulphur dyestuffs, oxidation black with aniline fluoride, two-color effects, umbrella goods, etc. A practical paper, with various valuable hints.

Surface of Textile Fibers, and its Importance in the Process of Dyeing

Dr. H. Mark—I. Progr, n. Ind. Tint, e Tess. 29,208 (1930.)—

The Present State of Industrial Micro-biological Maceration of Textile Plants

Prof. D. Carbone—l. c. p. 211.—Two brief papers of of general nature.

Vat Dyestuffs, Benzanthrone Series

German Patent No. 436,887 (10/*XI*/'26)—*I.G. Farben-Ind. A.G.*—Benzanthrone is treated with hypochlorous acid, the product converted to hydroxy-derivatives by treatment with caustic alkali, the hydroxy-derivatives converted to ethers, and these ethers subjected to alkaline condensation in the customary ways. The one example describes a clear marine blue (on vegetable fibers), whose vat is violet blue. The product, as would be expected, is of excellent fastness.

Dextrine Substitutes

Eduard Herzinger—Monats. f. Textil-Ind. 45,403 (1930).—Owing to the fluctuation in price of dextrine during the past few years, various substitutes for it, which, being of less variable cost, permit closer calculation of expense, have been proposed and tried out. Most of these substitutes do not possess the dependable qualities of dextrine itself, however, but are nevertheless of more or less value, when it is borne in mind that they are of course not dextrine.

One of the substances mentioned favorably is "Apparatin," which is merely potato-starch (15 parts) stirred up in cold water (100 volumes) and mixed with caustic liquor of 40° B. (3.5 volumes) and left to react. The starch, which is not in paste form in the sense in which the term is generally employed in reference to starch, but rather in suspension, the mixture being cold, is converted by the action of the alkali into a tenacious, brittle mass. After ½ hour, the alkili is neutralized by addition of about 6 volumes of 30% acetic acid (it must be just neutralized, and no more). If, in the preparation of the compound, 100 liters of cold water are used, then the caustic liquor may be diluted with 20 liters of water, and likewise the acid; in this case about 150 liters of finishing bath will be formed. The author also adds 40 kilos of denatured sirup, and enough hot water to bring the total volume finally to 300 liters, 25 kilos of magnesium sulphate being then added and dissolved. The liquor will then "spindle" about 10° B., and gives the same degree of stiffening as a dextrine-glue mixture of 12° B.

Olein is also a possibility in the way of addition to the above.

A bath made up of glue (the odor disguised by addition of benzaldehyde), glycerol, and Glauber salt, with the addition, perhaps, of a finishing soap, also affords a useful mixture.

The rest of the paper deals with various modes of use of a new commercial preparation, called W-Starch. It is characterized by being neither a soluble starch nor a swelling starch, but possessing characteristic properties of its own, not exactly intermediate between those of the two ordinary forms of starch.

Vat Dyestuffs, Perylene Series

German Patent No. 441,587 (3/III/'27)—*Kalle and Co.*—Perylene tetracarbonic imide, prepared, e.g., by fusing naphthalene-1-8-di-carbonic acid imide with caustic potash, is tetra-halogenated (chlorine) in chlor-sulphonic acid as a medium, at the ordinary temperature and pressure. A little iodine or other halogen carrier, as iron powder, may be added to assist the entrance of the chlorine, or none may be used. The end of the reaction, which proceeds smoothly, is recognized by dyeing the product (isolated by pouring upon ice) upon cotton, and boiling the dyeing with soap solution, the strong yellow-red color obtained changing thereby to a lilac, when the halogenation is complete.

Dyeing of Cellulose Esters

German Patent No. 433,349 (26/VIII/'26)—*I.G. Farben-Ind. A.G.*—The dyestuff, or the foundation for the final dyestuff, must contain one or more aldehyde groups, free, or in a combined condition such that the aldehyde group can be set free for reaction. Such components, taken up by the fiber, are then converted to their respective hydrazones. The dyeings are certainly fast to washing, and, like most pyrazolones, yellow to brown or golden in tone.

Dyeing of Cellulose Esters

German Patent No. 434,980 (5/X/'26)—*I.G. Farben-Ind. A.G.*—Mono-azo dyestuffs, basic, which contain a sulphamino-group in the residue of the active component, are recommended.

Fast Developed Dyestuffs

German Patent No. 441,985 (17/III/'27)—*Gesellsch. f. Chem. Ind. in Basel.*—The claim is advanced that dyeings very fast to washing, and possibly so to light and chlorine, are producible by the use of alpha-naphthol (as first component), which has been substituted in the 4-position by a triazine ring, which in turn is substituted in the two carbons of its ring, by radicals either inorganic or organic in nature. Three examples are given, and also a table covering 26 possible combinations, with notes upon the tones produced.

We should hesitate to say whether the excellent fastness to washing is due to the triazine ring as an appendix, so to say, to the naphthol residue, or whether almost any other similarly complex substituent in the naphthol ring might not likewise enhance the fastness to washing—i.e., the greater the molecular volume, the less easily the dyestuff is washed out, always supposing that there is no true chemical reaction between the dyestuff, in some part of its structure, and the substance of the fiber. Another factor also to be considered, however, is the fact that in this case the coupling must take place adjacent to the hydroxyl, the 4-position being blocked. This ortho-coupling may have something to do with the fastness.

Vat Dyestuffs (Hydrosulphite) Containing Sulphur

German Patent No. 445,217 (4/VI/'27)—*Leopold Cassella and Co.*—There are two claims included, which are practically the same in scope. In the first claim, 2-amino-perinaphthoxy-penthiophene is condensed with 2 -anils of 2-3-diketo-dihydrothionaphthenes of the benzene or naphthalene series, or with alpha-isatine derivatives of the benezene or naphthalene series (alpha-isatine arylides or chlorides). In the second claim, acyl derivatives of the 2-amino-perinaphthoxy-penthiophene are used, and the final products in some cases ultimately hydrolyzed. The new products are fast blue-green to pure green dyestuffs, ordinary hydrosulphite vat-dyestuffs, in spite of their containing sulphur. They are stated to be the first dyestuffs of the thio-indigo series which dye pure greens. Four examples are given.

$4,000 Cheerfully Spent for a Machine and $2.50 Grudgingly Spent for Lubrication

By W. F. SCHAPHORST, M.E.

AN INSTANCE was just recently brought to my attention of an executive who makes it a point to personally select all of his important machinery. First cost does not seem to bother him at all. What he is after is the best he can get. He spends $4,000 for a single machine without "batting an eye."

However, after selecting the machinery he seems to feel that his work is done and from then on the purchasing is performed by someone else and is accomplished on a price basis. The executive simply tells his order clerk to buy the lubricant, the belting, and such things, and cautions the clerk to be "careful." The clerk forthwith thinks he is doing the best that can be done when he buys the lowest priced articles he can get. Like so many others he misinterprets Ben Franklin's old adage that "A penny saved is a penny earned." If Franklin were alive today he would doubtless amend that saying to read like this: "A penny wisely spent in first cost will save a hundred pennies."

As a result, in the above mentioned plant the belting to and from the machinery is about as cheap and poor in quality as can be obtained. Little regard is given to the strength of the belting, its flexibility, its coefficient of friction, its surface adaptability, its elasticity, its thickness, its waterproofness, etc. In spite of the fact that manufacturers have been told over and over that each per cent of belt slip means one per cent in loss of production and that each per cent of belt slip means an additional loss of one per cent of fuel cost, it is not uncommon to see executives of the above type purchase the best machinery obtainable and then buy the cheapest belting to connect it to the engine or to the plant. Economical power transmission between machines is just as important as economical traffic between cities like New York and Philadelphia. Imagine a cheap one-track railroad between such cities! Poor transmission between pulleys means LOSS just as emphatically as between cities. As for lubricating oil, methods followed in the purchase of oil are even more deplorable than in the purchase of belting. Poor lubricant not only causes fuel loss and production loss, but, worst still, it permits an expensive machine to wear itself out in a short time. Poor belting, at least, does not cause internal machine wear, whereas poor lubricant DOES. If the above executive would make a careful study of the importance of proper lubrication and the differences that exist in oils he would make it a point to personally select the best oil obtainable. He would specify the oil and would tell his order clerk to buy that oil, and no other. It is better to pay $5.00 per gallon for the highest grade of lubricating oil that can be bought than to pay ten cents per gallon for the poorest. In other words, by paying $4.90 extra you are buying low cost insurance for your expensive machinery.

R & H Elects New Officers

At the regular annual meeting of the Directors of The Roessler & Hasslacher Chemical Company, Inc., in New York City, April 27, officers were elected to serve for the following year.

Several vacancies which occurred since the last annual meeting were filled. Both of the new Vice-Presidents, Dr. E. A. Rykenboer and Dr. M. J. Brown, are from Niagara Falls and will continue to make their headquarters in that city. Mr. Colby Dill, the newly elected Secretary, will make his headquarters in New York City.

Dr. M. J. Brown received his Ph.D. degree at Cornell in 1911, in which year he also joined R & H as a chemist in its Niagara Falls plant. Several years later, 1917, he was transferred to the company's Perth Amboy plant to install an electrolytic process for the production of raw materials for cyanides, of which a shortage existed because of the World War. In 1919 he was sent to California to become resident executive of the Pacific R & H. Chemical Corporation, whose factory was primarily established to provide fumigation material to the citrus industry in that region. Dr. Brown returned in 1923 to the Niagara Falls plant as Assistant to 2nd Vice-President. In 1926 he was made General Superintendent of the Niagara Falls plant and also a Director, and in 1929, Assistant Vice-President of the company.

The other new Vice-President, Dr. E. A. Rykenboer, graduated from the University of Rochester in 1912 and took his Ph.D. degree at the University of Michigan in 1917. The same year he joined R & H as a research chemist in its Niagara Falls plant where he later became senior chemist. Dr. Rykenboer was appointed Production Superintendent of the Niagara Falls plant in 1926, and in 1929 became the General Superintendent. In September, 1930, he was made a Director of the company.

The Pharma Chemical Corporation has moved to new offices in the Flatiron Building, 939 Broadway, on the 18th floor.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

DYER—Six years' experience at bleaching and dyeing wool, cotton, jute and union raw stocks and yarns. Thoroughly experienced in all stages of carpet manufacture. Age, 26; married. Address: Classified Box No. 676, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.